TTERS AND PAPERS

ON

griculture, Planting, &c.

ADDRESSED TO THE

and Weſt of England Society,

FOR THE ENCOURAGEMENT OF

griculture, Arts, Manufactures, and Commerce.

VOL. V.

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ON

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SELECTED FROM

THE CORRESPONDENCE

OF THE

Bath and Weſt of England Society

FOR THE ENCOURAGEMENT OF

AGRICULTURE,
ARTS,
MANUFACTURES,
AND COMMERCE.

VOL. V.

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M DCC XCIII.

INTRODUCTION.

FTER a lapſe of two years from the printing of the fourth, the Bath Society preſents the Publick with the fifth volume of its memoirs. The very favourable reception with which the former volumes have been honoured both at home and abroad, has been flattering to the moſt active Members of the Society; and the Committee of Papers particularly has felt a proportionate ſolicitude that the preſent publication may be found of equal importance.

In the ſelection now made from the general maſs of correſpondence, regard has been principally paid to ſubjects of acknowledged moment, and it is preſumed that the ſtyle and manner of the following pieces will be found in ſome inſtances maſterly; in all clear and perſpicuous. To the principal authors, the Society feels itſelf bound to return thanks for an obliging continuation of former correſpondence, and to expreſs a ſuitable ſenſe of obligation to others.

As the finances of the Society, by an extended patronage, are deemed in a flouriſhing ſtate, notwithſtanding the increaſed expences which have accrued, the Publick may reaſonably expect to hear of the increaſing ſtability and uſefulneſs of this inſtitution. And as the Society has much to hope from the preſent general diſpoſition to promote improvements in the department of agriculture, that greateſt of all national objects, the further communications of practical Gentlemen and intelligent Farmers are warmly ſolicited.

Should it happen that ſuch communications may not all be deemed of equal value for the publick eye, and ſome writers may not be gratified with ſeeing their pieces in the printed liſt, they may nevertheleſs be aſſured that their intentions are well received, and that their hints and experiments are preſerved for the inſpection and advantage of the members. A conſiderable number of pieces, which have lately been received, are lying over for future conſideration,—and the Committee will not fail to bring them duly forward, with a view to their being approved, and publiſhed in a ſucceeding volume.

Bath, May 31, 1790.

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LETTERS

TO THE

BATH AGRICULTURE SOCIETY.

ARTICLE I.

On the Improvements in Agriculture that have b ſucceſsfully introduced into this Kingdom thin the laſt Fifty Years.

Y improvements in agriculture, I underſtand uch an artificial management in the culture land, as may increaſe the value of its produce *e* than in proportion to the expence which has n incurred in procuring ſuch increaſe; or, in er words, Improvements conſiſt of, and are eſtiiated by, the increaſe of nett profits or gain, acuired by means of art and ſuperior management ſed in the cultivation of land.

The means of ſuch improvements, I conceive, may be fitly claſſed or arranged under the following general heads, viz.

1. Improvements in the art of tillage.

2. In the invention of new implements, or improvements of thoſe in uſe before.

3. In the quantity of ſeed moſt proper to be ſown, and in the regular diſtribution of the ſame both as to diſtance and depth.

4. In ſuiting the crop to the nature and condition of the ſoil.

5. In the rotation, or moſt beneficial ſucceſſion of crops.

6. In manures, natural and artificial.

7. In the ſucceſsful introduction of ma articles into field culture.

8. In the advantages of applying them to and fattening cattle, &c. &c.

SECT. I. *Of Improvements in the Art of Till*

Tillage conſiſts in breaking, crumbling, an verizing the ſoil; which in the early ages of culture was performed in a very imperfect ma but from experience it was found that the perfectly this was performed, and the cleaner weeds the ſoil was kept, the larger, the cleaner, and conſequently of the more value was the produce.

improvements in tillage, however, it ſeems, went on very ſlowly, till Mr. Tull, of very reſpectable memory, taught the vaſt advantages, indeed the neceſſity, of a more perfect tillage, in order to a more ſucceſsful and more profitable return.

Improvements which have been made in tillage are of very great importance, as it may truly be ſaid to have been the baſis or real foundation on which the ſucceſsful introduction of all the new articles of field culture depend, as will clearly appear hereafter, when we treat particularly of thoſe articles. When the ground is well tilled, it is in the moſt perfect condition for receiving the fertilizing principles of the atmoſphere. Rain, ſnow, dews, and hoar froſt, &c. convey the nutriment of vegetation, which floats in the air, moſt plentifully into the boſom of the earth, as deep as it has been broken, and well pulverized; which it imbibes very freely, and incorporates thoroughly therewith. It is the only effectual means of deſtroying weeds, ſo neceſſary to the beneficial growth of all crops, and ſhould be repeated till they are in a great meaſure deſtroyed; which, by being continually expoſed to the ſun and wind, will be much ſooner than can be effected by any other means. The roots and fibres of weeds are the ligaments and braces which in a great meaſure knit and bind the *clods together, which in a manner are perfectly in-*diſſoluble, till by being expoſed to the viciſſitudes of the air, the roots within rot and decay, and the clods, almoſt by their own gravity, with little or no external preſſure, expand of themſelves into ſmall crumbles, and are reduced to a perfect ſtate of pulverization, which is as far as tillage can go.

The deſtroying of weeds, however, is not the only immediate benefit accruing from a due ſtate of tillage; grubs, beetles, worms, and maggots of many different kinds, which abound in many fields, may be greatly diminiſhed, if not entirely extirpated and deſtroyed, by the well-timed uſe of the plough and its auxiliary inſtruments neceſſary to the reduction and due pulverization of the ſoil. Nothing effectually prevents the ravages of the ſeveral [illegible] of ſubterraneous inſects, as the frequent ſtirring and crumbling the ground; I have had large patches of ſeveral poles ſquare in a field of beans deſtroyed by the grub of the cock-chaffer; and many hundreds of cabbage plants by a kind of grey grub of leſs ſize. Both theſe execute their miſchief under ground. The firſt eat the roots of the beans even when in kid, when they wither, fall, and die; the latter bites off the ſtem of the plant juſt under the ſurface, and does infinite miſchiefs; but I have always found tillage, duly performed, deſtroy the whole race.

The improvement the ſoil acquires by means of quent and well-timed tillage, is gradual and progreſſive, and the longer it is kept in tillage, if duly performed, the more fertile it becomes.

One ploughing in the beginning of winter, and a ſecond in the winter, or early in the ſpring, will be more effectual in pulverizing and fertilizing the ſoil than half a dozen at any other time of the year. I have at this time a piece of eight acres, which bore wheat laſt year. It was ploughed in October, and lay till the end of February, when I had it dragged. It is now in fine condition, and the ploughman, who has ploughed it many years, ſays he never ſaw it in ſuch fine tilth before. It is a ſtrong piece of ground, and rather damp. I have another piece of ſix acres adjoining to the latter, exactly of the ſame texture and temper; this, by reaſon of the long hard froſt, we could not plough till February; it is now ſo lumpy and obdurate, that I think all the ploughing, rolling, dragging, and harrowing, that can be given to it, will not bring it into proper tilth to plant this ſeaſon. Such is the mighty difference between ploughing for a ſpring crop in October and February.

This improvement in tillage is ſo very clear and certain, that it ſurprizes one much that it is not univerſally practiſed. But in this country, and I believe in many others, the ſarmers are led aſtray by a falſe policy which obtains among them. Many of them at Michaelmas take in ſheep to winter at 4s. 6d. a head, and keep them till the firſt week in April, ſo that they are obliged to keep their ſtubble ground and *eddiſhes** for the ſupport of theſe ſheep; and by that means, when their land ſhould be in fine tilth for ſowing, they have ſcarcely a field ploughed; by which means they commonly loſe three or four times as much in their ſpring crops as they receive for the keep of their ſheep. It is true, as they obſerve, it helps them to a little ready money at a time they ſtand in need of it. But ſurely it is extreme bad policy to take 4s. 6d. to pay 10s. 15s. or 20s. in eight months after; or loſe ſo much in the nett crop, which is exactly the ſame thing. It will require at leaſt two acres for the keep of each ſheep, ſo that the farmer receives at moſt no more than 2s. 3d. per acre, whereas a winter's fallow, if the ground be well prepared, is of more real value than 20s. worth of dung laid on the ſame. From all which this corollary may be fairly drawn, that the land intended for the crop the following ſpring, can be put to no uſe, the advantages of which in general can by any means equal a winter's fallow.

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* Graſs that comes after mowing.

SECT.

SECT. II. *Of the Invention* [illegible] *new Implements of Huſbandry, or Improvements in the* [illegible]*d.*

This article comprehends ploughs of every denomination, drags, harrows, horſe and hand hoes, machines and implements which have been invented to perform the ſeveral operations of huſbandry in a more perfect manner, and with leſs trouble and expence.

In former times ploughs were very ill-conſtructed; ſome little more than ſcratched the ground, others were made ſo heavy and clumſy as to require great ſtrength to work them. Leſs than four horſes could do nothing with them. There are now ſeveral in uſe which perform much better, viz. the *Rotheram* or *patent plough*, the *one-wheeled plough*, and the *Norfolk plough*, which I believe is the laſt, and, it is ſaid, by much the beſt in uſe; as it will plough up ſtrong land with two horſes only, a man, and no driver; ſo that it does as much work and quite as well as the ſtrong heavy two-wheeled plough, which requires four horſes, a man, and driver; being double the expence of the Norfolk-plough for the ſame quantity of work. A very great improvement indeed!

But there is another plough in uſe, which it is ſaid does twice the work of this in the ſame time, at a little more expence; that is, the *Double Plough*, which ploughs two furrows in the ſame time any other does one. This plough requires only three horſes and a man, but no driver. I have ſeen it at work in a large field, and go perfectly ſtraight from one end to the other, without the ploughman's ever putting a hand to it. I believe theſe two laſt ploughs are the lateſt and greateſt improvements which have been made in this inſtrument for general uſe.

There are others of a more modern invention uſed for particular purpoſes, of which that with two mould-boards is a valuable invention. With this plough I make the open furrows for planting potatoes, and then compleatly cover the ſets by ſplitting the ridges. When they have been horſe-hoed, it again ſplits the ridges in the intervals, and earths up the plants. It effectually anſwers the ſame purpoſe in all broad drilled crops where the horſe-hoe is uſed, and with half the labour performs the ſame work as could be done with the common plough, and in half the time.

There are other ploughs of leſs general uſe, ſuch as the trenching plough, which ſometimes goes to the depth of eighteen inches; draining-ploughs, and ploughs for denſhiring and ſelling; and laſtly, I ſhall mention a ſmall light plough for ploughing the intervals of drilled crops, which may either be in the form of the Rotherham plough, or the one-wheeled plough, either of which would anſwer the purpoſe as effectually as any horſe-hoe whatever.

Sect. III. *Of the Quantity of Seed moſt proper to be ſown, and on the regular diſtribution of the ſame, both as to diſtance and depth.*

The improvement made by the great ſaving of ſeed in modern practice is very great. It is very certain from experiments, moſt ſatisfactorily authenticated, that about one-third of the ſeed which was formerly uſed, and indeed is ſtill in moſt places, is fully ſufficient. In general it produces a better crop than the whole quantity. In the old huſbandry or broad-caſt method of ſowing, it is uſual to allow from two to three buſhels of ſeed-wheat, as the ſeaſon happens, to a ſtatute acre; but in drilling or ſetting, as practiſed in the Eaſtern counties, it is found that from three to five pecks is quite ſufficient; ſo that the difference between the two modes of planting amounts, at leaſt, to a ſaving of one buſhel and a half per acre. If then theſe new modes of planting all ſorts of grain were equally adopted, the ſaving, I conceive, would be an addition to the year's produce, a tenth or twelfth of its whole amount. The farmer, therefore, who in any one year might plant one hundred acres of wheat in the new method, would ſave at leaſt one hundred and fifty buſhels of ſeed. If the ſavings of ſeed then on one hundred acres would be one hundred and fifty buſhels, how amazing would be the amount of the quantity ſaved on all the tillage lands of Great-Britain!!

This is a very intereſting object to individuals, and in a national view one of exceeding great importance. It would therefore be very patriotick to uſe every means to promote and extend the practice.

This improvement in planting has all the prejudice of the common farmer to contend with. He has been uſed, perhaps, almoſt half a century, to ſow his land with wheat at the rate of two buſhels and a half per acre, and at harveſt too frequently has obſerved he has not half a crop; from which he haſtily concludes, that if he had ſown but half the quantity, ſmall as his crop was, it would have been but half as great. His land is frequently in very imperfect tilth, very rough, and full of large lumps; however, the ſeedſman ſcatters the ſeed on the ſurface, and in harrowing, a part is covered ſo deep as never to appear, another is never covered at all, but is picked up by the birds; ſo that it frequently happens that not one-third of the ſeed ever vegetates and arrives at maturity. But in planting by hand, every corn is placed at the intended depth and diſtance, and not one in a thouſand miſcarries. This mode of planting has now been in uſe ſeveral years in Norfolk, Suffolk, &c. and is annually extending itſelf, and doubtleſs will continue to do ſo, as in general it produces conſiderably better crops with ſo great a ſaving in the ſeed. The only objection which can be made to it is the expence of ſetting it, and the great number of hands it requires; more indeed than can at any rate in many places be procured. In anſwer to the firſt objection, it is ſaid the price of planting by hand is now only about 5s. an acre, which is very little in proportion to the increaſe of produce, and the value of the ſeed ſaved. The ſecond objection is entirely obviated by the many inſtruments lately invented for ſowing the ſeed very regularly at any required depth and diſtance, either in cloſe drilling to be hand-hoed, or in open drilling with intervals of a proper width for horſe-hoeing. It is true theſe have not been ſo generally uſed as might have been reaſonably expected; the reaſon of which, I am fully convinced, is the high price the ingenious inventors have ſet upon them. Farmers in general are prejudiced againſt the practice, and *a priori* cannot conceive the poſſibility of the new mode being any way equal, either in the quantity of produce, or in point of profit, to the old method; therefore will never run the riſque of laying out ſixteen or eighteen guineas to make trial of an inſtrument, which they are ſo fully perſuaded they ſhould never make the leaſt beneficial uſe of. If ever the practice of drilling, either *cloſe* or *wide*, becomes general, it muſt be by the example of men in eaſy circumſtances and ſuperior condition, who are not afraid of expending a few pounds with a view to promote the public good, in which their own is conſpicuouſly included.

SECT. IV. *Of ſuiting the Crop to the Nature and Condition of the Soil.*

In former times the farmer was governed more by the price a commodity would yield at market, than by the conſideration of what the nature and quality of his land was beſt adapted to produce. But experience, and the introduction of many new articles into field culture, have given him a much larger field to range in; and now a ſenſible farmer regulates his practice by the conſideration of what his land is ſuited to produce a large and profitable crop of, without too great trouble and expence. For example: Wheat is the great ſtaple article, the prime object of a farmer's care and attention; yet there is much land that is totally unfit to bear that grain, that is applicable to the growth of many other articles which are attended with great advantage. The ſame obſervation will hold good in reſpect to almoſt every article in culture. Improvements in this article then conſiſt in making art ſubſervient to nature, in reaſonably aſſiſting her in her mode of acting, for ſhe ſeldom can be diverted from her own bias, but at an expence that will be far from proving profitable.

SECT. V. *Of the Rotation or moſt beneficial Succeſſion of Crops.*

This head comprehends improvements of great magnitude and extent. The articles of culture are commonly divided into two claſſes, viz. One conſiſts of crops that are ſaid to exhauſt and impoveriſh the land they grow on; the other to ameliorate and improve it. This muſt be underſtood in a comparative ſenſe; for properly ſpeaking there are few if any vegetables that are carried off the land they grow on to be conſumed elſewhere, but in ſome meaſure exhauſt and impoveriſh the ſoil, and render it leſs fertile.

The firſt claſs, viz. thoſe which are ſuppoſed to exhauſt the land moſt, are fibrous-rooted plants, as wheat, barley, rye, oats, &c. The ameliorating includes all the legumenous and tap-rooted plants, as beans, peaſe, vetches, turnips, parſnips, carrots, clover, &c. Modern improvements are much increaſed by a judicious ſucceſſion of interchanges among thoſe articles. An ameliorating following an exhauſting crop, prepares the land for another exhauſting crop, and eſpecially if it be a hoeing crop; for by judicious management the land may be conſtantly cropped for many years in ſucceſſion, without the intervention of a fallow every third or fourth year, as was heretofore the practice.

SECT. VI. *Of Improvements by Means of Manures both Natural and Artificial.*

By a manure we underſtand any ſubſtance which being added to, or laid on land, increaſes its fertility. This we conceive may be effected by means which operate very differently, therefore we ſhall treat of them under two diſtinct heads:

1ſt. Thoſe that act mechanically.

2dly. Thoſe that act chemically.

The ſubſtances which increaſe the fertility of land by mechanical means, are all thoſe which by mere addition and intimate commixion improve its texture. Thus ſtrong, wet, heavy clay, by the mere addition of ſharp ſand, or fine gravel, may be opened, rendered more light and porous, and conſequently much more fertile. And light ſandy and gravelly ſoils, whoſe open, looſe, incoherent texture ſuffers the rain, dews, &c. ſuddenly to paſs through them, are much improved by the addition of ſtrong binding

ing loams or clay, which render its texture more coherent and productive of vegetable nouriſhment. Among theſe may be reckoned marles of all kinds, chalk, ſhells, and indeed every kind of ſubſtance, which, merely by its texture, has the property of rendering ſoils that are too adheſive, cloſe, and heavy, more light, open, and porous; and thoſe that are too looſe and incoherent, more denſe, conſiſtent, and retentive of whatever is added to it intentionally by way of improvement, or happens adventitiouſly in the courſe of nature. But marles, chalk, ſhells, &c. properly ſpeaking, are improvers of the ſoil, not merely as they correct and amend the texture, but alſo by their chemical powers, which produce an increaſe of vegetable nouriſhment, and give fertility to the ground. So that they act in a double capacity, that is to ſay, both mechanically and chemically.

It is perhaps of little uſe to enquire, whether the above ſubſtances eſſentially contain any real vegetable nouriſhment, or only act miniſterially in the procurement and diſtribution of the ſame. All abſorbent ſubſtances are powerful attracters of water, oil, &c. and probably to the power of attraction all their virtue is owing. The humid vapours of the air, which abound with putrid exhalations, are copiouſly imbibed by thoſe abſorbent earths, and from thence are inhaled by the roots and fibres of plants.

The atmoſphere is the grand magazine, the great receptacle of putrid vapours, which are conſtantly exhaled and flying off from the ſurface of the earth, and from the whole race of vegetables and animals which ſubſiſt upon it. Theſe putrid exhalations conſtitute the true genuine vegetable *pabulum*, or food of plants; therefore whatever ſubſtance of an abſorbent nature attracts thoſe principles more powerfully than the ſoil it is laid on, will, to ſuch land, be a manure, and infallibly improve the ſame.

Thoſe ſubſtances which are of a calcarious nature, and can be burnt into lime, have their powers as manures greatly improved thereby; provided they are uſed ſo as to impregnate the ſoil before their virtue is diminiſhed or impaired by being expoſed to the air. Lime, of whatever ſubſtance it is made, whether of ſtone, chalk, or ſhells, by being expoſed to air for a few days, expands and falls into a fine powder, and thereby loſes its active principles cauſed by the fire, and becomes totally effete and dead, poſſeſſed preciſely of the ſame virtues as the ſtone, chalk, or ſhells, of which it was burnt, and no more. The diſcovery therefore of the true method of uſing lime, ſo as to impregnate the ſoil with its active principles, is a very great improvement in practical agriculture; for before this was known, large ſums of money were expended in laying lime on the ſurface of land, where it ſoon became effete and dead, and acted only by its mechanical properties in the ſame manner the ſubſtances of which it was burnt would have done had they never been burnt; ſo that the whole expence and trouble of burning was ſo much thrown away.

SECT. VII. *Of the ſucceſsful Introduction of many new Articles into Field Culture.*

If in the idea of new articles be included thoſe which have been transferred from the garden to the field, the number will be far from being inconſiderable. Turnips, potatoes, cabbage of different kinds, carrots, parſnips, &c. were cultivated for domeſtick uſes, long before the time propoſed; but the field culture of theſe articles for the feed of cattle in any conſiderable degree,* is quite a modern practice. The ſucceſs which hath attended the uſe of theſe articles, hath inconteſtibly eſtabliſhed their great value and importance; but unfortunately their culture hath hitherto been much confined, and is very far from being generally practiſed.

Many kinds of graſſes have likewiſe been ſtrongly recommended as valuable improvements, which, having anſwered the ſiniſter views of ſome of the recommenders, in ſelling their ſeeds at a great price, and upon trial being found greatly inferior to the ſpontaneous growths of this country, have very deſervedly fallen into general diſuſe, and are no more thought of. There are two articles, however, commonly reckoned among the graſſes, which muſt ever be diſtinguiſhed and ſeparated from thoſe that have been found uſeleſs, that is to ſay, Sainfoin and Lucerne; theſe merit more attention and care than have been uſually beſtowed upon them, and would well repay the farmer for all his expence and trouble, if beſtowed with diſcretion and judgment, for they certainly might be made improvements of the moſt valuable kind.

Sainfoin has been ſown pretty extenſively in ſome parts, but not ſo generally by far as it deſerves. It generally ſucceeds well upon chalk, from whence it has been very erroneouſly concluded, that it will not thrive in a deep ſoil. It is ſuppoſed a hard ſubſtratum of chalk prevents the deep penetration of the roots, which is the natural bias of the plant, for it is not known to what depth it would deſcend in a friable ſoil that would yield to the perpendicular deſcent of its root. From hence it is ſtrangely concluded, that the plant in ſuch ſoil is exhauſted of its vigour by the luxuriance of its own roots; and that the produce of the herbage on the ſurface is ſmall in proportion as that of the roots is large. This notion, repugnant as it certainly is to common ſenſe and reaſon, as well as to experience and obſervation, is firmly believed and maintained by men of very good abilities; ſo invincible are prejudices early imbibed, and ſupported by local cuſtoms, and habits of practice long eſtabliſhed.[1]

The writer is clearly of opinion, that there are few arable farms in the kingdom which are not capable of great improvement by planting of ſainfoin, more eſpecially thoſe which are but poorly provided with good paſture and meadow land. The pooreſt fields of ſuch farms might by proper management be brought to produce good crops of ſainfoin; and land, the natural intrinſick value of which is not more than from 2s. 6d. to 5s. an acre per annum, might certainly, at a very moderate expence, be made worth from 20s. to 40s. This would prove an unſpeakable advantage to the occupier as well as to the owner of a farm that is almoſt wholly arable, as it would enable him to keep a much larger number of milch cows, and hogs in proportion, and by theſe means greatly increaſe the quantity of manure for the improvement of his corn-fields.

The greateſt enemies ſainfoin has to encounter are graſs and weeds: theſe, in land that is tolerably good, ſoon overcome and deſtroy it, unleſs the farmer will take the trouble, and be at the expence of keeping it clean. But this is by no means ſo formidable an undertaking as hath been generally thought, provided the land be very well cleaned and duly pulverized before the ſeed be ſown, and provided alſo it be ſown in rows from fifteen to eighteen inches diſtant, which is as near as it ought to be ſown, if intended for a laſting plantation. At thoſe diſtances, the intervals between the rows may be kept perfectly clean with a ſmall plough and a narrow drag of about twelve inches wide. With theſe inſtruments ſeveral acres may be cleaned in a day, and ſuppoſing this to be done three times in a ſummer, the expence would amount but to a trifle. My drag is twelve inches wide, and proves extremely uſeful in drilled crops of every kind, as alſo in thoſe of what nature ſoever that are planted in rows.

Lucerne, under a ſimilar management, would be a very great improvement on arable farms. Indeed an opinion generally prevails, that it requires a much better ſoil than is commonly found. Crops of all kinds are more abundant on a good than on a bad ſoil, if they are kept clean; but it is a very erroneous opinion, that lucerne will thrive only on rich land. It may be raiſed to great advantage on land of a very indifferent quality, by the ſame means as above recommended for ſainfoin, and the ſame care to keep it free from graſs and weeds. I have cut five good crops off ſuch land in one ſummer, after having been planted five years, without a grain of manure of any kind, except a ſmall ſprinkling of turf aſhes the ſecond year after ſowing the ſeed. A few acres of either, or both theſe graſſes, with a few more of potatoes, cabbage, or turnips, would enable the occupier of an arable farm to keep from eight to twelve, or even twenty milch-cows, according to the ſize of his farm, though he ſhould not have an acre of meadow or paſture belonging to the ſame.

Of articles which are truly uſeful and entirely new, we know of few that have been introduced within the time mentioned. The turnip-rooted cabbage is a truly valuable root, which was accidentally diſcovered about twenty years ago, and has been cultivated with great ſucceſs by ſeveral gentlemen, and ſtrongly recommended by them to the attention of the farmer. Both its roots and greens are exceeding good food for cattle, but what conſtitutes its principal excellence is its extreme hardineſs, for it reſiſts the violence of the moſt rigorous ſeaſons and ſevereſt froſts. When the common turnip and hardieſt c[illegible]age have been entirely cut off and deſt[illegible]yed, this has continued its fine verdure, and ſupplied the kitchen with greens, and the cattle with ſweet and wholeſome roots, even till the middle of May.

Another new article which has been very lately introduced is the Mangel Wurzel, or Scarcity Plant. From the ſucceſs ſome few gentlemen have had in its cultivation, it ſeems to promiſe to be of the greateſt utility for the feed of cattle. However, it is very little known as yet, it being ſuppoſed that not one farmer of a thouſand has ſo much as ever heard of the name. It is generally agreed to be a ſpecies of the beet, of which there are many. The ſeeds of both have exactly the ſame appearance, and the leaves and roots differ only in colour and ſize, for the manner of their growth is exactly the ſame; but the leafage of the new ſort is ſaid to be much more luxuriant and abundant, and the roots vaſtly larger.

In order to diſcover the moſt advantageous mode of raiſing this plant, I ſowed, or rather ſet, a quantity of the ſeed in ſeveral different ways in April laſt. The beginning of July the outſide leaves had obtained their full growth, ſome of which I broke off and offered to the horſes and cows, who ate them very freely; but when offered to the pigs, they ſeized them with great eagerneſs, and devoured rather than eat them. The pigs are ſtill fed with them daily, and conſtantly prefer them to every kind of green food or root that can be given them. Breaking off the leaves takes up much time, and is very troubleſome; therefore, when the outſide leaves are fully come to maturity, I cut the whole clean off about an inch and a half above the ground, from whence freſh leaves ſhoot up very freely. My experience is yet too ſmall to ſpeak with confidence; but it ſeems to me that an acre of this plant, if it takes well, would be ſufficient to keep twenty pigs very well for five or ſix months, ſay from July to November or December incluſive.

Another article of food for cattle has been lately recommended as the ſweeteſt and beſt in the world, ſold under the title of *Carolina Graſs Seed.* I ſowed a very ſmall quantity of the ſeed in my garden in April laſt; it came up well, and is now in a very flouriſhing ſtate. Time will diſcover if it is in any degree ſuperior to many of the ſpontaneous productions of our own climate. No quantity, I believe, has been hitherto obtained that is adequate to that purpoſe. From the ſmall trial I have made, it ſeems no way difficult to propagate, if the ſoil be well pulverized and clean before it is ſowed.

SECT.

SECT. VIII. *Of the Advantages accruing from the introduction of the New Articles above ſpecified into Field Culture, in applying them to the rearing and fattening of Cattle.*

The improvements made by cultivating turnips for the feed of ſheep and fattening of cattle, is ſo generally known, and extenſively practiſed, that it ſeems unneceſſary to ſay any thing on that head. I will, however, beg leave to obſerve here, that the opinion generally maintained, that turnips are an improper food for milch-cows, as it ſpoils the cream and butter by impregnating the milk with the ſtrong flavour of the turnip, appears to me, by repeated experiments, to be ill-founded. The two laſt winters and ſprings my milch-cows lived chiefly on turnips, and their butter was found not only as good as my neighbours, whoſe cows ate none, but was even preferred to it. They ſay their opinion is grounded on experience as well as mine. The difficulty, I apprehend, lies here: My turnips are pulled, brought home, and given to the cows in the yard; their cows have been uſed to be turned in upon them, where they pick up the charlock and other weeds which abound among them, for they are never hoed; and to this, and not the turnips, I am perſuaded, the diſagreeable flavour of the milk is owing. It muſt be obſerved that the turnips ſhould be given to the cows while they are freſh and firm, for all food when grown putrid and corrupted is unwholſome, and doubtleſs would affect the juices of the animals that eat it.

Of all the articles we have mentioned, or that is yet known, perhaps very few can equal, and none excel the *Potatoe*. The ineſtimable value of this root is hardly to be conceived. It is not only an almoſt conſtant diſh in great and opulent families, but in times of ſcarcity and dearneſs, the poor are almoſt wholly ſubſiſted by it. There are many poor families in this neighbourhood, who the laſt winter ate them three times a day with a little ſalt, without a morſel of meat or bread with them. It is true they have been long in uſe for the food of man, but it is of late date that they have been extenſively cultivated for the feed of cattle; and even now, I am pretty clearly of opinion, that if they were much more generally cultivated than they have hitherto been, the farmer would find his account in it, eſpecially where a ſubſtitute is much wanted in the winter and ſpring ſeaſons for the ſupport of his cattle.

Hogs are immoderately fond of potatoes, and will live entirely upon them till they are fit to put up a fattening for pork or bacon; and then, boiled and mixed with barley or peaſe meal, they fat them ſpeedily and make fine meat. Another uſe I have put them to, which has been little practiſed, or thought of; that is, for the feed of milch-cows. Three gallons a day, half at night and half in the morning is quite ſufficient to keep a large cow in full milk, and the milk as ſweet and as good as in the ſummer months. Nothing excels them for the feed of cows which are fatting their calves for the butcher. I fatted four laſt ſpring, which were ſold for from 35s. to above 40s. a calf, which was double what I ever ſold any for at this place before. Laſt year, after taking them up, ſeveral calves, about ſix or ſeven months old, were turned into the potatoe ground with the cows; they fed upon them as kindly as ſo many pigs, and preferred them to every thing elſe they could meet with.

I have had no experience of their uſe as food for horſes; but I have been aſſured by a gentleman who reſided ſome years in Ireland, that he kept his hunter, a ſtone-horſe, entirely upon them inſtead of corn. He ate nothing elſe, excepting hay between his feeds of potatoes, as other horſes; yet he was as fat, as healthy, as ſtrong, and as full of ſpirits, as if he had given him all the corn he could eat.

On

ARTICLE II

On the Culture of Potatoes by the eaſieſt and moſt œconomical Means.

[By Mr. JOSEPH WIMPEY, to the Secretary.]

SIR,

SINCE the potatoe has been in univerſal demand for the food of cattle, as well as of families, their culture hath become an object of general attention and regard. Men of every claſs, from the princely owner of a palace to the meaneſt cottager, have exerted their ſkill in attempting to improve it both in quantity of produce and in goodneſs. As to quantity, ſome have ſucceeded beyond all expectation.

In examining ſome of thoſe accounts, the writer hath been much ſurprized to find their culture hath been attended with ſuch enormous expences, even as far, if he remembers right, as 14l. or 15l. per acre. This put him upon conſidering if a leſs operoſe and more œconomical method might not be practicable, by which, though the quantity of produce might be conſiderably inferior, yet the nett profit might be ſuperior, and that in no ſmall degree, all things conſidered.

In purſuit of theſe ideas, the writer, the two laſt years, adopted the following method, which fully anſwered his expectation. A particular of which, containing an exact account of the expences, quantity of produce, amount of the crop at a certain price per buſhel, and laſtly, the nett profit of two ſtatute acres of land ſo cultivated in the year 1788, is as below.

In Dec. 1787, two ſtatute acres were ploughed up and lay rough through the winter. The February following, the ground was well dragged, forty cart loads of long dung were then equally ſpread upon the ſame, and immediately ploughed in. The beginning of April, furrows were drawn the length-way of the field with a double-breaſted plough, at about two feet eight inches diſtance one from the other, in which the potatoe ſets were dropped by hand, at the diſtance of from 12 to 14 or 15 inches, which were covered by ſplitting the ridges with the ſame double-breaſted plough, throwing one half of the mould to the right hand, the other half to the left, and by that means forming a ridge over each rank of ſets, and leaving a deep furrow in each interval. In this ſituation they continued till the ſets had ſhot five or ſix inches.

By that time the weeds began to appear in great abundance. A ſmall common one-wheel plough was then ſet to work, as near each ſide of each rank of potatoes as could be without damage to the plants. This operation raiſed high ridges in the intervals between the rows.

In this ſtate it continued till the weeds began to advance again in their growth. The double-breaſted plough was then ſet to work again, going up the middle of one row, and down another, by which operation each ſide of the plants were compleatly earthed up; and before freſh weeds could vegetate, the luxuriance of the greens was ſuch as to completely cover the intervals; ſo that the whole ſurface of the field had one uniform appearance.

In this ſituation they continued till about the 20th of October, when the greens being moſtly decayed, and the weather very fine, they were begun to be taken up in the following manner: A ſtrong plough was ſet deep enough to work below the bed of the roots, with which the ploughman goes up one row and down another, turning the roots up to the ſurface. Women, boys, and girls, follow the plough, and pick them up in baſkets as faſt as they are turned out. A pair of drags with long tines are drawn over the ground after it has been picked, by which many are brought up to the ſurface, which had eſcaped the pickers. When the whole field has been gone over in this manner, we then give it a clean ploughing and harrowing, by which means very few roots eſcape. Thus the whole operation is completely gone through, and the land left in the moſt perfect condition for the immediate reception of a crop of wheat.

An exact account of the produce, expence, and nett profit of two ſtatute acres planted with potatoes in manner aforeſaid. Produce 750 buſhels; tithe paid in kind deducted, ſay 75 buſhels, leaves 675; which at 1s. per buſhel, or three ſhillings per ſack, amounts to - - - - - £.33 15 0

EXPENCES.

	£	s.	d.	£	s.	d.
A clean ploughing in winter	0	12	0			
Dragging in February	0	3	0			
40 loads of long dung, and carriage	4	0	0			
Spurling ditto	0	2	0			
Ploughing in the dung	0	12	0			
Striking furrows with double-plough	0	6	0			
Planting and cutting potatoes	0	6	0			
Covering them with double-plough	0	6	0			
Sets 15 ſacks at 3s.	2	5	0			
Ploughing intervals from the rows	0	6	0			
Earthing up the plants	0	6	0			
Taking them up, ploughing up, drawing home, ſtacking, &c. 3 horſes, man, and boy, 5 days	1	10	0			
One man, one woman, 5 days	0	7	6			
Boys and girls	0	5	9			
A year's rent	2	0	0			
				13	7	3
Nett profit on 2 acres				£.20	7	9

or 10l. 3s. 10½d. per acre.

But to do juſtice to the experiment, the ſucceeding crop of wheat ſhould be charged with at leaſt 4l. and that ſum added to the nett profit would amount then to 12l. 3s. 10½d. per acre, for it would have coſt ſo much at leaſt to have brought the barley ſtubble into ſo perfect a tilth and fertile condition as the potatoes left it in.

It may be very proper to obſerve, however, that the culture of potatoes for ſale, probably, cannot be extended much farther, in many places at leaſt, the markets being already overſtocked, and the price fallen, ſeemingly more in proportion than the increaſe in quantity. Three or four years ſince, the current price of potatoes in this neighbourhood was 6s. per ſack, and often more; ſometimes as high as 12s. Laſt year I ſold ſome for 2s. 6d. none for above 3s. and at preſent I have little proſpect of diſpoſing of what I ſhall have to ſpare of the above quantity, even at thoſe low prices.

Hence it becomes a queſtion of very conſiderable importance, what is the real and intrinſick value of this root to the grower when applied to feeding of his own ſtock, from the time of taking it up to the time of planting, ſay from October to May following, that is, ſeven months out of the twelve. If this ſhould be found to anſwer in any deſirable degree, the farmer might with ſafety cultivate as many as he could conſume with advantage, without depending upon a foreign market, which, by means of an exceedingly extended cultivation, is become very precarious. Add to this, the potatoe in itſelf is a periſhable commodity, and when ever ſo well kept muſt be diſpoſed of in about eight months, or become totally uſeleſs.

But as the above queſtion involves a great deal of *practical* knowledge, which is attainable only by real experiment, and as I am now feeding of different kinds of ſtock on potatoes, I hope therefore to be able to write on this ſubject with greater preciſion, and will beg leave to lay an account of this matter before your reſpectable Society in ſome future paper.*

On examining the account of the above experiment, I ſee little reaſon for making any alteration in the mode of culture there practiſed. After the firſt ploughing in the winter, I think if it were to be followed by a ſecond acroſs the firſt, and the land thrown up into ſharp narrow ridges by one bout of the plough, or by the double-breaſted plough, the land would be much more effectually expoſed to the influence of the atmoſphere, and the improvement much greater in proportion, than a half ploughing would amount to, being only an addition of 6s. to the expence; the winter being the ſeaſon when the fertilizing principles deſcend moſt copiouſly to impregnate the earth.

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* Such account will be received with pleaſure.

I ſhould obſerve, in ploughing up the potatoes, we always take out the coulter, which would cut and damage a great many of them; but in this way the buſineſs is performed without the leaſt injury; as a proof of which, I did not ſee one root that was at all hurt by the plough

My principal object in adopting this method of cultivation was not the obtaining the largeſt quantity of produce poſſible, but rather the largeſt that could be got conſiſtently with cleaning, ameliorating, and improving the ſoil. This was my firſt and principal object, and perhaps a more effectual method is not eaſy to be found. Had the largeſt quantity of produce been the only thing aimed at, the number of rows might have been doubled, and inſtead of 32 inches, 16 only might have been taken. The produce in that caſe, doubtleſs, would have been much more conſiderable, but then the land would have loſt all the benefit of horſe-hoeing.

Since writing the above, I have had the pleaſure of reading the learned Dr. *Anderſon*'s very valuable teatiſe on this article. The great accuracy and *preciſion with which his experiments are conducted, are very ſingular and curious, and his ſubſequent* obſervations and concluſions not leſs inſtructive and uſeful than they are ingenious and entertaining. His diſcovery, that the acreable produce is in a great meaſure in proportion to the quantity (weight) of ſets or bulbs planted, (contrary to what obtains in many other articles) is, perhaps, one of the moſt important diſcoveries of the preſent age. And I muſt add, I have the ſatisfaction of ſeeing it in a good meaſure confirmed by my own practice in the foregoing account.

By that account it appears that I planted fifteen ſacks of ſets in two ſtatute acres of land; about a third more than I ever allowed before, and I believe than is commonly uſed. The increaſe of produce was not only in proportion to the increaſed quantity of ſeed by meaſure, but alſo in the ſize and fair appearance of the bulbs, which indeed were ſo much improved, that I could not help heſitating for a good while, if ſome miſtake had not been committed in the ſorts planted, which I could by no means account for.

Two of the ſorts I planted were produced by a friend in London two years before, and were ſaid to be the ſorts moſt in demand in that market. One of them was the kidney ſort deſcribed by the Doctor, and I think one of the beſt kinds yet known for the table. The other was a round, white, fair potatoe, the name of which I never learnt, but it was a very good one. The firſt year of planting, the produce exactly correſponded with the ſets, but the ſecond, that abovementioned was ſo much improved as quite to confound my judgment. This pleaſing amendment can be imputed to nothing elſe but the weight and ſize of the ſets planted. In this I was rather particular, ſuffering in general none to be planted leſs than a large pullet's egg; the larger ſizes were cut into two, and the largeſt into four pieces.

For ſome three or four years paſt, I have alſo made ſome trials of raiſing potatoes from ſeed. The events of my trials differ conſiderably from thoſe of the ingenious Doctor. The firſt year I had ſome bulbs as large as a pullet's egg, but I did not then remark any variety of ſorts. The largeſt of theſe were preſerved, and planted the following April. The October following they were carefully dug up, and were as large in general as thoſe produced from old bulbs; many of them from half a pound to a pound and upwards. Among theſe, very contrary to what happened to the Doctor in his experiments, there were not leſs than five or ſix different ſpecies, moſt of them totally different, not only from the parent ſtocks, from which the ſeeds were obtained, but alſo from every other ſpecies I had ever ſeen, or have to this hour. They were of different colours, figures, and texture. Some a ſmooth yellowiſh white, ſome a duſky brown, ſome a reddiſh brown, ſome had a rough ſkin, ſome ſmooth, ſome diſtinct ſingle bulbs of a regular ſhape, others a congeries of bulbs from 6 to 10 or 12, connected together by a kind of neck, compoſing a maſs, ſometimes nearly as big as a half-peck meaſure. But there was one ſpecies which far exceeded all the reſt in beauty; many of them were as big as a gooſe's egg, a fine clear ſmooth ſkin of a yellowiſh white, finely pounced with ſmall crimſon ſpots, the complexion beautiful, and the ſubſtance as good as I ever taſted.

The bulbs, which produced the ſeeds of which theſe varieties were obtained, were of two very different ſpecies, but no more than two. One was an oblong white potatoe of no very common ſhape. Many of them were gibbous at each end, connected by a part much ſmaller in the middle, a good family potatoe. The other was of a browniſh red colour, finely marbled on the inſide with a crimſon purple; a very fine juicy potatoe, much in uſe in this country for feeding hogs, but little valued for family uſe. Theſe two ſpecies are all I had at that time; from which the apples which produced the ſeeds were promiſcuouſly gathered in the ſame field, and ſown together in the ſame ſpot.

The Doctor ſeems to doubt if the ſexual ſyſtem of Linnæus takes place in the propagation of new varieties in this uſeful plant; but it ſeems very certain from the above account, that varieties of them are attainable from ſeed, and that moſt probably by the bloſſoms of ſome plants being impregnated with the male duſt of others, ſimilar to what happens to the whole tribe of cabbages, carrots, and parſnips, beets, &c. If this be not admitted, we muſt have recourſe for a ſolution to *ſeminal variations* in the primitive ſenſe of the phraſe; which is not only infinitely more improbable, but perhaps totally inadmiſſible and irreconcilable to the principles of ſound philoſophy. Nothing can be more certain, than that the moſt minute variation muſt have had a pre-exiſting cauſe competent to its production; otherwiſe it unavoidably follows that an effect may be produced and exiſt without any cauſe at all, which is abſurd and impoſſible.

That the pea tribe continue invariably the ſame, though they ſhould be reared in the moſt promiſcuous manner, the Doctor ſeems fully convinced, and

I have nothing to offer againſt it; but he ſays alſo, "all the kinds of beans poſſeſs the ſame property." With all due ſubmiſſion to the Doctor's ſuperior judgment, I muſt think in this he is certainly miſtaken. In 1787, I planted a field chiefly with garden beans of moſt of the ſorts known; they were planted in rows about a yard aſunder, in the following order: Mazagan, White-bloſſom, Long-podded, Sandwich, Toker, and laſtly, Windſor. The Mazagan and White-bloſſom were threſhed firſt, when to my great ſurpiſe I found I had quite a new ſpecies, or rather ſeveral. The Mazagan, inſtead of their being of their natural colour, were mottled black and white; the White-bloſſom, inſtead of their natural jetty ſhining black, were brown, black, and yellow, blended together, and both much larger than uſual. The Long-podded were alſo very much of the ſame colour. Here then is an undeniable proof that beans, of ſome ſorts at leaſt, are as ſubject to ſeminal variations as any claſs of plants whatſoever. I aſſert this with great confidence, as the experiment was not made on a ſmall trifling ſcale, for I had eight or ten ſacks of theſe beans which I had agreed with a ſeedſman for at 5s. a buſhel. When they were threſhed, I wrote him word what happened, and diſpoſed of them among my hogs and horſes.

It may be of ſome uſe to obſerve here, that I ſuffered no loſs by this unexpected accident, as at firſt was apprehended, for they turned to better account than they would have done if ſold at the price abovementioned. I have ſince found, by repeated experience, that beans are a much more hearty and profitable food for horſes than oats. Being out of old oats the two laſt ſprings, I ſubſtituted horſe-beans in their ſtead. In the room of a ſack of oats with chaff, I ordered them a buſhel of beans with chaff to ſerve the ſame time. It very ſoon appeared the beans were ſuperior to the oats, from the life, ſpirit, and ſleekneſs of the horſes. Valuing the beans at 40s. per quarter, and the oats at 20s. the keep of the horſes with oats would coſt juſt double what it did in beans, and not ſo well kept neither.

What the Doctor has advanced on the diſtemper called the *curl* in potatoes, I think very juſt. That it is generally occaſioned by diſtempered ſeed, I have not the leaſt doubt. How the ſeed becomes vitiated and corrupt is another queſtion, which perhaps admits of no ſatisfactory ſolution. There are many other ways, I apprehend, by which both animals and vegetables, that are robuſt and healthy during one part of their exiſtence, become diſtempered, and even their *ſtamina* vitiates the remainder; beſides hereditary deſcents, or what they may acquire by *juxta poſition*.

The ſmut in wheat, I have long been of opinion, is generated by a very wet ſeaſon happening during the time of its being in bloſſom. This I eſteem the cauſe and origin of the diſeaſe; but I am well aſſured it may be, and often is, propagated and continued by uſing the corn thus vitiated for ſeed. Laſt year I made ſome experiments on ſmutty wheat, hoping to obtain ſome information I might rely on. I ſowed part of a ridge in drills about twelve inches apart with good ſound ſeed; another part, immediately adjoining, with ſeed taken from very ſmutty corn. It had been previouſly waſhed in two ſeveral waters; what ſwam at top was carefully ſkimmed off, and the waſhing continued till no blackneſs remained. Another portion of the ſame ridge, adjoining the former, was drilled with part of the ſame ſmutty wheat unwaſhed, juſt as it came from the ear, without any preparation whatever; the reſult was as follows:

The crop from the ſound ſeed was perfectly free from ſmut, clean, and good. That from the ſecond had many ſmutty ears among it, perhaps one in twenty. The third and laſt was miſerably ſmutty indeed; I believe half of the [illegible] at leaſt were infected. As all three parcels of ſeed were ſown in the ſame land, at the ſame time, in the ſame manner, and managed the ſame in every ſtage of its growth, it ſeems clearly to follow, that good clean ſound ſeed in a favourable ſeaſon will produce good ſound corn; that ſeed infected with the ſmut, though well waſhed in water, will retain a part of the infection, and produce a ſmutty crop; and that ſmutty ſeed, ſown without any waſhing at all, will produce a crop ſo ſmutty as to be of very little value.

In like manner, I apprehend, the potatoe, and perhaps every other kind of vegetable, though originally of the moſt firm and perfect ſtamina, may, by an intemperate air, conſuming blights, or a combination of unſuſpected cauſes co-operating together, vitiate the original ſtamina, and induce imbecility and a diſtempered conſtitution, which may be propagated through all ſucceeding generations.

The pureſt and beſt means of guarding againſt and preventing this evil, is to follow the advice given by the very intelligent Doctor, which is to ſelect for ſeed the largeſt, faireſt, ſoundeſt, and beſt complexioned bulbs; by which means you will moſt probably avoid thoſe that may be infected with this deſtructive malady. The Doctor hath truly obſerved, that the curled are always of an inferior ſize; to which I will add, they are alſo of ſo unpleaſant an aſpect, that an eye of modern diſcernment will eaſily diſtinguiſh them from thoſe that are ſound.

Let the ſeed be judiciouſly choſen, and planted in the moſt proper ſeaſon, there will then be very little reaſon to fear a profitable crop of good ſound potatoes, of a deſirable ſize, if managed according to the directions in the former part of this paper.

Impreſſed with gratitude for the many marks of approbation conferred on me by your very reſpectable ſociety, I beg leave to recommend this paper to their conſideration.

And am, Sir,
With great reſpect and eſteem,
Your obliged humble ſervant,

JOSEPH WIMPEY.

North-Bockhampton,
Nov. 10, 1788.

* * *

ARTICLE

ARTICLE II

An Enquiry concerning a ſure and certain Method of improving ſmall Arable Farms.

[By the ſame, to the Secretary.]

SIR,

IT is generally thought, and on very good grounds, that ſmall arable farms do not afford the occupier ſo good a maintenance as dairy farms of the ſame annual value. That the latter will do well and ſave money, while the former, with a vaſt deal more labour and trouble, is ſtarving himſelf and family. This matter has been fully inveſtigated in a former paper, and the true reaſon aſſigned; but a ſure and certain remedy, which would enable the farmer to live and pay his rent punctually, is greatly to be wiſhed, and would be of univerſal convenience. An attempt to effect which is the intended uſe of this paper.

The advantage and propriety of applying land to the growth of ſuch articles to which nature has moſt fitly ſuited it, has been ſhewn at large, and alſo that all land which is naturally and properly arable, can by no means be converted into meadow, or valuable paſture of any duration. Such as, from a wild ſtate of nature, overrun with furze, fern, buſhes, and brambles, has been rendered fertile by means of the plough, muſt be kept in that improved ſtate by its frequent uſe, otherwiſe it would ſoon revert to that wild barren ſtate which was its original condition.

A farm, therefore, which conſiſts wholly, or almoſt ſo, of land that is properly arable, muſt ever continue arable; for it is not practicable to render it in any degree fertile, but by means of the plough; or to keep it long ſo, even when it is made ſo. But though arable land cannot be converted into meadow or paſture proper for a dairy, it may be planted with articles which, it is well known now, will anſwer the purpoſe of feeding horned cattle, eſpecially milch-cows, as effectually as good meadow or paſture, producing as much milk, and altogether as rich, as ſweet, and as good.

But the great intereſting queſtion is, Whether thoſe articles which can be procured only by the heavy expences of ploughing, harrowing, ſeed, and other operations which neceſſarily attend their culture and harveſting, will afford as much ſuſtenance in proportion to the expence, as meadow or paſture which is liable to little or none, excepting what is made into hay, the cattle gathering it for themſelves as they conſume it?

To aſcertain this fact, we muſt enquire, what may be the average expence of keeping a milch-cow on a dairy-farm for any given time? It is ſaid, upon very good authority, that the expence generally is from 3l. to 3l. 10s. per annum. Two acres and a half of paſture fit for this uſe is ſufficient to keep a cow the whole year through, and ſuch land is valued at from 25s. to 30s. per acre. At 25s. ſuppoſe, the keeping of each cow would amount to 3l. 2s. 6d. per annum. A dairy farm, therefore, conſiſting of forty-eight acres at 25s. per annum, would amount to 60l. rent per annum; and the number of cows that might be kept upon ſuch a farm, allowing two acres and a half to each cow, would be nineteen and a fraction, therefore we will ſay twenty.

In the next place, let us enquire, what would be the average expence of keeping a cow upon food raiſed in arable land as a ſuccedaneum to graſs, &c. rent and every neceſſary expence included?

We are aſſured, by unqueſtionable authority, that a buſhel of potatoes, given half at night and half in the morning, with a ſmall allowance of hay, is ſufficient to keep three cows a day. On that allowance their milk will be as rich and as good, and the quantity as great, as in the ſummer months when the cows are in good paſture.

In a former [illegible] we have ſhewn, that an acre of land, properly cultivated with potatoes, will produce 337 buſhels, and the total expence of cultivating an acre, rent and tithe included, was 6l. 13s. 7½d. If three cows eat ſeven buſhels per week, then they would eat 365 buſhels in a year; and twenty cows would conſume 2433 buſhels. The queſtion then is, If 20 cows require 2433 buſhels to keep them a year, and as above an acre of land properly cultivated will produce 337 buſhels nett, how many acres will be required to produce 2433 buſhels, or the quantity neceſſary to feed 20 cows to keep them in full milk the year round? The anſwer is, Seven acres and a quarter nearly.

If then an acre of land can be cultivated with potatoes, as above, for 6l. 13s. 7½d. the cultivation of ſeven acres and a quarter will amount to 48l. 8s. 9½d. We have ſeen, as above, that the rent of a dairy farm, capable of maintaining 20 milch-cows, is upon a medium 60l. but it clearly appears that the ſame number of cows may be kept equally well on a very ſmall part of an arable farm planted with potatoes for [illegible]l. 11s. 2½d. leſs than that ſum, which is ſo much in favour of the arable farm; or in other words, ſeven or eight acres of arable land, under this mode of management, are as much ſuperior to forty-eight acres of meadow or paſture, as the difference of the two ſums mentioned; the arable farmer receiving as great a ſum for the expenditure of 48l. 8s. 9½d. as the dairy farmer doth for his bare rent of 60l. without reckoning a penny for incidental expences.

It muſt be obſerved, that in this ſtatement no allowance is made for the ſmall quantity of hay given to the cows with the potatoes. It muſt be noted alſo, that the account of cultivation is charged with 40s. an acre for manure, and ſome expence of ploughing, which of right is chargeable to the crop of wheat that is to follow. Now if we deduct 40s. an acre from the expence of cultivating the potatoes, it reduces the ſum to 4l. 13s. 7½d. and the whole expence then upon ſeven acres and a quarter is only 33l. 18s. 9¼d. and conſequently the keep of 20 cows is little more than half to the occupier of the arable farm, what it is to the occupier of the grazing farm. If this concluſion be fairly drawn, and the calculation free from errors, as I hope and believe, it is matter of the greateſt importance, eſpecially to the little arable farmer. It plainly raiſes him from a ſtate of acknowledged great inferiority, to one altogether as ſuperior.

It may be ſaid, this calculation reſpects potatoes only; how will this mode of culture anſwer when applied to the growth of other articles of food uſed as a ſuccedaneum to herbage? Let us try.

By an experiment made on a pretty large ſcale, lately, by Mr. VAGG, it ſeems to appear, that cabbage on arable land is much about as ſuperior to natural paſture as potatoes.——His experiment was made on twelve acres of land, which was very far from being the moſt ſuitable for a crop of cabbage. The average value about 30s. per acre, and the whole expence of the culture, carting off included, 1l. 14s. 1d. per acre. The rent and expences of cultivating the twelve acres then amounted to 38l. 9s. He ſays the ſtock he fed with it was forty-five oxen, and upwards of ſixty ſheep; that it fed them three months, and that he is very well aſſured that they proved as faſt upon it as they do in the prime months of the ſeaſon, May, June, and July. Now if, inſtead of ſixty ſheep, we reckon fifteen oxen, or that four ſheep are about equal to one ox, in which we cannot err much; then ſixty oxen were kept well for three months, or, which is the ſame thing, fifteen oxen for a whole year, for 38l. 9s. and conſequently twenty would coſt 51l. 5s. 4d. which is not quite 3l. more than the keep of 20 cows coſt in potatoes.

It is ſomewhat extraordinary that two experiments, made on articles ſo very different in their nature, ſhould ſo nearly coincide in their effects when applied to the ſame purpoſe. Turnips, turnip-rooted cabbage, carrots, parſnips, and ſome other articles, by many experiments often repeated, have been found quite adequate to the ſame valuable purpoſes, at leaſt ſo far as to be more lucrative than meadow or paſture. I omit clover and rye-graſs, becauſe they have been long in general practice; but are in common very ſhort of the advantages which may be derived from the cultivation of the other articles recommended.

There is one other article, however, which is particularly worthy of the arable farmer's utmoſt care and attention, which he may rely on with great confidence, if he will be at the pains of thoroughly cleaning his land, and of keeping it ſo for two or three years after it is planted. The article I mean is Sainfoin. From the miſerable appearance it often makes the firſt year, I long doubted if its ſucceſs in poor land was not very precarious; but I have now the fulleſt conviction, that it will grow and produce a very good crop in poor land, provided the ſoil be dry, and proper care be taken to keep it clean till it be fully eſtabliſhed in the ground.

Small arable farms, which in a manner are quite deſtitute of herbage, cannot well be ſupplied with any ſubſtitute that is by any means its equal. Indeed one acre of good ſainfoin is of more value than two acres of middling meadow or paſture. And as it will thrive ſo well on a very poor ſoil, the arable farmer, who either keeps no cows for want of herbage, or keeping them is pinched for food for them, is perfectly ignorant of the advantages attending the culture of this plant, or miſerably indolent and inexcuſable in not better attending to his intereſt.

Whatever crop precedes the planting ſainfoin, the ground ſhould be ploughed in the winter, and laid up in ſharp deep ridges by one bout of the plough, to continue till the beginning of April. Then it ſhould be dragged and harrowed level: and if the land be very poor, it ſhould have ſome light dreſſing of aſhes, ſoot, or a compoſt of lime, earth, and rotten dung, well incorporated together. A ſmall quantity of either of theſe would greatly encourage the plants in their infant ſtate. The beginning or middle of April, as the ſeaſon may prove, the ſeed ſhould be ſown, and there would be little danger of its ſucceeding to one's wiſh.

Perhaps there cannot be a better nor a ſurer means of cultivating this very uſeful plant to the greateſt advantage, than by ſowing it after potatoes.

The horſe and hand-hoeing them during their growth, and the ploughing, dragging, and harrowing the ground to clean it of the potatoes, ſo thoroughly deſtroy the weeds, and pulverize the ſoil, that it is made in the moſt perfect condition for a crop of ſainfoin; and though the land may in its nature be very poor, the manuring properly for a crop of potatoes, and that being grown perfectly rotten, the ſoil is become ſufficiently fertile.

Beſides the above, perhaps there are very few articles in uſe as ſubſtitutes for paſture, that are equally profitable with carrots and parſnips, when the ſoil is ſuitable to their manner of growth and culture. The ſoil they delight and flouriſh moſt in is a deep, light, free ſoil, which is eaſily penetrated, and moderately fertile. In ſuch a ſoil, if properly hoed and ſet out at due diſtances, they will arrive at a great magnitude, and the acreable produce be very ſurpriſing. Another advantage is, their being ſo very acceptable to the farmer's ſtock of every kind. Horſes, cows, ſheep, and hogs, eat them ſeemingly with the ſame appetite, and are equally improved by them. Unfortunately the quantity of ſuch land bears but a ſmall proportion to what is totally unſuitable to them. Hard, ſtiff, obdurate land, and ſuch as ſtrongly coheres, is quite unnatural to them, and never anſwers the expence and terrible; what grows in ſuch land being very ſhort, generally forked, and of ſmall value. Potatoes, cultivated as above directed, would, I think, be as good a preparation for thoſe roots as can well be invented. If the ſoil be well manured for the potatoes, it will be ſufficiently fertile for carrots and parſnips, and, lying through the winter in fallow, will be in excellent order for ſowing the ſeeds of theſe roots the March following.

Upon the whole of this account, it ſeems clearly to follow, that an arable farm of 50l. or 60l. per annum, though it has not an acre of meadow or paſture land belonging to it, may by ſkill and proper management be made to produce as much and as good butter and cheeſe, as a dairy farm of the ſame value, and have a large proportion of land left for the growth of corn and other purpoſes.

For inſtance; twenty acres of the ſixty, I conceive, would be competent to the maintenance of the ſtock abovementioned, and they might be fitly divided as follows: viz. Six acres of potatoes, two or four of cabbages, two of turnip-rooted cabbage, and two of turnips, making together twelve or fourteen acres; the remainder to be ſainfoin; in all twenty acres. The proportion to be varied, and ſome articles exchanged for others, as the nature of the ſoil and particular circumſtances migh[illegible]uire, and as the farmer might think fit and proper. twenty acres thus planted, I reckon, beſides twenty milch-cows, ſix or eight young cattle, and pigs in proportion, might be well kept on the offal.

It may be aſked, ſhould this plan be generally adopted by the farmer, for whoſe uſe it is principally intended, if it would not be running out of one extreme into another? If ſo conſiderable an increaſe of milk, butter, and cheeſe, would not lower the prices of thoſe articles too much, and raiſe the price of wheat in a greater proportion? That it would lower the prices of theſe articles is very certain, and it is a very deſirable circumſtance that it ſhould. At this time, and for ſix weeks paſt, butter has been ſold in this neighbourhood for nine-pence a pound, and will moſt probably be ſold for ten-pence very ſoon; whereas, I ſhould hope, the average price might, by the propoſed improvement, be reduced to ſeven-pence.

There is little danger, however, of the price of wheat being advanced by the appropriation of about twelve acres of land annually to the cultivation of the above articles; for the land would be ſo much improved by the extra tillage given to the ſoil intended for thoſe articles, and alſo during their growth, that I am rather of opinion they would produce more corn than if conſtantly planted in the uſual very imperfect manner.

The greateſt obſtacle to this mode of managing a ſmall farm (ſay from 20l. to 60l. per annum) is, the confined or narrow circumſtances of the occupiers of ſuch farms. In general their capitals are much too ſmall to carry on their buſineſs to any advantage in the preſent mode of management; but the mode recommended would require an increaſe of capital to the tune of 200l. or 300l. Leſs than 400l. would not ſtock a farm in this way of 60l. per annum at any rate; but a capital of 500l. would be vaſtly more convenient, and indeed much more to the farmer's advantage.

If the improvements propoſed are ſo intereſting to the individuals immediately concerned, how very important are its effects in a political view, as it reſpects the community at large! If eight acres of land, by ſkill and management, can be rendered as productive and as profitable as forty-eight acres, whoſe natural produce is of a medium value, it is virtually increaſing the extent of territory in a ſix-fold proportion; for if every acre of land could by art and induſtry be made to yield ſix times the quantity of produce it does at preſent, the whole might be rendered capable of ſupporting ſix times the number of the preſent inhabitants.

But this is far from being the whole of the advantage that will accrue from it. It will not only increaſe the quantity of proviſions as aforeſaid, but it will alſo find abundance of employment for the poor labourer and his family. In this reſpect dairy farms are in a manner of no uſe; they afford little or no employment at all for the poor labourers. Within a few miles of me lives a dairy-man, who milks conſtantly between twenty and thirty cows. He has no wife, keeps only one maid-ſervant, has neither man nor boy to aſſiſt him, and only hires a woman in the neighbourhood to aſſiſt in milking night and morning, for which he pays her 15d. or 16d. per week. This is his whole expence in the management of his dairy; ſcarce a tenth part of his rent; whereas every arable acre, cultivated with potatoes, &c. as above, will coſt four or five times as much as the rent of the land they grow on. What an amazing difference doth this make to the poor of a populous country, and alſo to thoſe who muſt either find them employment, or maintain them without any!

I have often employed a poor family in planting potatoes, and alſo in following the plough and picking them up when harveſted; a man, his wife, and two children, about 12 or 13 years of age. The man I paid 6s. a week, the woman 3s. and the two children 3s. together 12s. A very pretty income for a poor family! At theſe times they uſually got them a few clothes; at other times, when I had no employment for them, they have been often obliged to ſeek relief from the pariſh.

It is certainly a matter of great importance to all men in buſineſs, to do all in their power to promote the beneficial employment of the poor; it not only ſerves to alleviate a burthen, which in many places is become intolerable; but is alſo the ſureſt means of keeping the poor honeſt. Many of them, I hope, would never have thought of being otherwiſe, if they had not been firſt impelled by neceſſity; who from petty pilferings to get a penny, go on to greater thefts, till they too often go to the gallows; whereas, had they been conſtantly employed, they would have been neither neceſſitous nor idle—the two grand ſources of all the evils they ſuffer, and the injuries they do to ſociety!

I am, Sir,

Your moſt obedient ſervant,

North-Bockhampton,
Nov. 25, 1788.

JOSEPH WIMPEY.

ARTICLE I

Reflections on DRILL-MACHINES, *particularly ſuggeſted by an Account of one invented by Mr.* BARNES.

[By the ſame, to the Secretary.]

SIR,

I Congratulate the publick on Mr. BARNES's invention of a new Drill-Machine. In Art. xliv. of your 4th volume, he ſays, "Whenever it ſhall "be fully before the publick, I flatter myſelf, it will "be found to poſſeſs, at the price of ten guineas, "at leaſt *more* than all the valuable properties con-"tained in other machines of a much higher price." If ſo, I will venture to add, it has at *leaſt* twice their merit, [illegible] more compleat, and but little above half their price.

The benefit accruing to the publick from improvements in agriculture, by means of new inventions to facilitate its operations and reduce its expences, muſt ever be in proportion to the extenſive uſe that is made of them; and theſe again will ever much depend upon the eaſe and moderate expence at which they may be acquired.

Were I the inventor of any machine or implement in huſbandry; which I had reaſon to think would be acceptable to the publick, I would ſet it at a price ſo moderate as could be no impediment to the ſale of it. It may be a queſtion, what would in this caſe be a moderate profit? The profits in trade, when the returns are not very large, we may ſuppoſe to run from 10 to 15 per cent. But in this caſe, where ingenuity is as neceſſary as diligence, we will ſuppoſe twice that ſum, or ſay from 20 to 30 per cent. would not be generally thought immoderate. On theſe terms, therefore, I ſhould hope, every one who had beſtowed his time and pains with a view to ſerve the publick, would, in the large demands he might have for his inſtruments, find a full and ſatisfactory recompence for his ingenuity, expence, and trouble, eſpecially if, in the conſtruction, his principal object was œconomy, as far as could be made to conſiſt with convenience and utility.

Had I the pleaſure of Mr. Barnes's acquaintance, I would beg leave to recommend theſe obſervations to his conſideration, being fully perſuaded, he would find the demand for his machine in proportion to the price; the lower in reaſon he makes it to the publick, the higher his intereſt would riſe in proportion thereto. I am of opinion, where a man ſells one machine for fifteen guineas, he might ſell fifty for five guineas each. It is eaſy for every inventor, on this ſuppoſition, to calculate which would be moſt for his intereſt.

The excellence of all inventions is meaſured by the quantity of good they afford the publick. Every inſtrument or machine, therefore, it ever ſo ingeniouſly conſtructed, and competent to its intended uſe, becomes almoſt uſeleſs, and of very little value to the publick, if the price be ſo high as almoſt totally to obſtruct and prevent the ſale of it. It is a kind of *felo de ſe*, and may be fitly compared to a law which permits the importation of certain articles of commerce, upon the payment of cuſtoms ſo immoderate as to all intents and purpoſes to amount to an effectual prohibition, by which no one is a gainer but the illicit trader.

Here then the ingenious inventor miſtakes his intereſt egregiouſly; he ſacrifices the virtue of the patriot, not to the *real* but to the imaginary intereſt of the individual, and ſuffers at once both in his intereſt and his credit. The ſureſt and moſt durable patent is moderation of price; thoſe that are purchaſed confine and reſtrain the ſale, but reaſonable prices encourage and promote it, whatever be the commodity at market.

Immoderate taxes are ever unfriendly to trade, and heavy charges and exorbitant expences are not leſs ſo to ſcience and the arts. Ingenuity, even mere pretenſions to ingenuity, are often taxed as high as any article of commerce. Subſcriptions for thouſands and tens of thouſands are propoſed and tendered to the publick, with as much eaſe, unconcern, and firmneſs of features now, as the moſt hardy veteran would have dared to have offered formerly for fives and for fifties. But this is an age in which credulity is become epidemical, and the alchemy and empiriſm of BEN JOHNSON's days are faſt gaining ground under another denomination, and in a different form. Should a comick genius ariſe of equal humour and parts, he might now find as ample a field of impoſture to range in as ever diſgraced that poet's times. The ſureſt and moſt effectual means of promoting and extending knowledge for the general benefit of the publick, is to render it attainable on the eaſieſt and leaſt expenſive means poſſible.

I hope no proprietor of any machine now in uſe will conceive, that any thing is here meant inimical to his intereſt. It is the writer's ſincere wiſh, that matters might be ſo ordered, as to render the intereſt of the proprietors compatible with that of the publick in general. Should the drill huſbandry be generally extended, as there ſeems to be good reaſon to expect, I will venture to ſay, new inventions of machines for drilling will moſt probably ſoon appear, of a very ſimple conſtruction, and at a price ſo moderate as will rarely be an impediment to their uſe, even among the loweſt claſs of farmers.

I have been for ſome years p[illegible] a conſiderable ſpeculator in this buſineſs, and have uſed many inventions for performing this mode of planting, hoping to find the eaſieſt, cheapeſt, and moſt œconomical manner poſſible. However, I am not able to determine the preciſe manner of planting, ſo as to produce the moſt beneficial crops for any ſeries of years in ſucceſſion. I call that the moſt beneficial crop, which produces the greateſt nett gain upon any given quantity of land, for any given term of years.

For this purpoſe I have ſowed this ſeaſon ſeveral fields of wheat in drills of very different diſtances, and in different modes. Some were ſown in rows of 18 inches diſtance with a hand-machine, with which at this diſtance a day-labourer ſowed from four to ſix acres a day, which was completely covered with one tine of the harrows. This ſimple machine was made by a country carpenter under my directions, and coſt only half a guinea. Other fields

I have planted in [illegible] very different manner, which indeed, for the three last years, has been my uſual cuſtom. The land being well ploughed, I throw it into ſmall ridges with three bouts of the plough. The diſtance then from the middle of one furrow to that of the next is about four feet ſix inches. The top of the ridge about a yard wide, and the breadth of the furrow 18 inches. *On the tops of the ridges I plant three rows of corn, at the diſtance* of ten inches from each other. This is performed with a machine which makes the channels, drops the corn, and completely covers it, at one operation. This machine was made by the ſame workman as the former, and did not coſt me more than about 30s. This inſtrument performs extremely well, the the corn is come up very regularly, the rows perfect, and the partitions clean. The firſt machine will ſow ſingle rows at any diſtance, and any ſeed from a horſe-bean to a turnip-ſeed.

The other inſtrument will ſow one, two, three, or five rows on each ridge, and any ſort you pleaſe. This laſt, however, is capable of improvement, and when made [illegible] complete as can be deſired, I think cannot exceed two guineas and a half. Theſe are the facts on which I ground my prediction; that the time will come when the price of inſtruments for this mode of planting will be no impediment to the general uſe of them, if th[illegible]de of practice ſhould ever prevail. But I poſtpone any alteration till I am better ſatisfied of the moſt profitable method of planting.

I am, Sir,

Your moſt obedient ſervant,

North-Bockhampton,
Feb. 14, 1789.

JOSEPH WIMPEY.

[Mr. WIMPEY's reflections on Drill-Machines contain much important truth—and as ſuch, the Committee could have no inducement to withhold them from the publick. On the contrary, they are inſerted as a freſh proof of the eſtimation in which his correſpondence on experimental huſbandry is held: but while the Committee agree with Mr. WIMPEY on the inventing ſmall, ſimple, and cheap machines for ſmall farmers, they are of opinion, that the expence of large and maſterly pieces of mechaniſm, is a ſmall object in compariſon with the advantages of greater expedition on a large ſcale of farming.]

ARTICLE V.

Prefatory Remarks; Hints reſpecting Potatoes, a Machine for bruiſing Furze, and a Plan for improving the Wool of this Country.

[By Dr. J. ANDERSON, to the Secretary.]

SIR,

SOME time ago I did myſelf the honour to write to you, acknowledging the receipt of the letter and parcel you were ſo kind to ſend to me, and giving ſome anſwer to Mr. ANSTIE's queries reſpecting Wool, which I hope you received.

Along with this you will receive ſome obſervations on the management of the dairy, particularly with regard to the making of butter, which are the reſult of experience; and I ſhall be happy if the members of your ſociety will accept of this as a teſtimony of my gratitude, and a proof of my deſire to forward, as far as in me lies, the beneficent views of your inſtitution.

I have a few more experiments on potatoes, that are nearly ready for being communicated; among other diſcoveries, the reſult of theſe experiments is a method of rearing potatoes ſo as to have them at any ſeaſon that may be wanted at a very ſmall expence. I had potatoes laſt ſeaſon without any ſort of cover, as large as to weigh from two to three ounces each, by the firſt of May. If you think the communication of this proceſs will be agreeable to the ſociety, I ſhall ſend an account of it. It never has been yet deſcribed in any publication that I have yet heard of.

I obſerve, among the premiums for laſt year, one is offered for a model of a machine for bruiſing whins [furze] as food for cattle; I have made uſe of a machine of that ſort, on a farm I have in Aberdeenſhire, for many years paſt, which anſwers the purpoſe very well. By the help of an old horſe of little value, it can be made to bruiſe enough for forty head of full-grown beaſts, were they to eat nothing elſe. I meant to have ſent a model of it, but as it is probable you may already have got one, I deferred executing it, till I ſhould hear from you whether you had got one or not. I have alſo cultivated furze as food for horſes and cattle with great profit.

In revolving Mr. Anstie's queries in my mind, and frequently thinking of the benefits this country might in time derive from being poſſeſſed of a very fine kind of wool of her own produce; and the convenience ſhe in certain reſpects poſſeſſes above all other nations, of improving the quality of her wool to a degree that never yet has been known in Europe; I have often wiſhed it were poſſible to find a few gentlemen who were willing to aſſociate themſelves *into a ſociety, for the expreſs purpoſe of* improving the quality of Britiſh wool. I would propoſe that it ſhould be done ſomewhat on the plan of your Society, or the Society of Arts in London, where a ſmall annual ſubſcription only is required from each member, with liberty to withdraw it when they may think proper. The buſineſs to be managed by a committee, choſen out of their own number. Should Mr. ANSTIE, or any other public-ſpirited gentleman in your neighbourhood, think it probable, that ſuch a thing, if propoſed, would be likely to take place, I ſhould explain the principles on which it might be conducted, and demonſtrate the practicability of it. I could be confident (without having communicated this plan to his Grace) that the Duke of Argyle, whoſe concurrence would be of great uſe for perfecting the plan, would not only countenance, but liberally forward the undertaking.

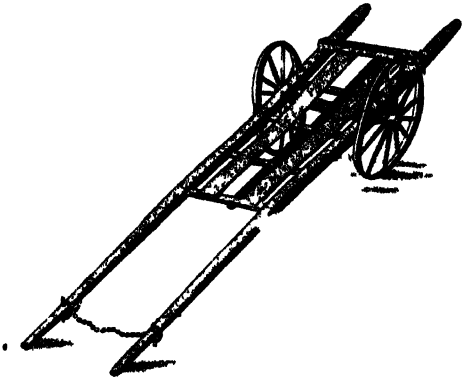
I am, Sir,

Your moſt obedient ſervant,

Cotfield, near Edinburgh, JAMES ANDERSON.
Feb. 4, 1789.

Plate. I.

[illegible]*ith Cart.*



Plan

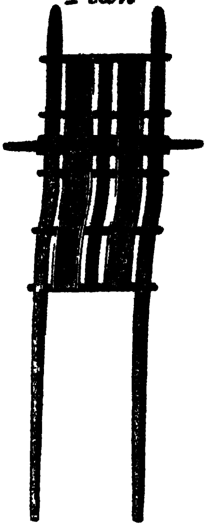
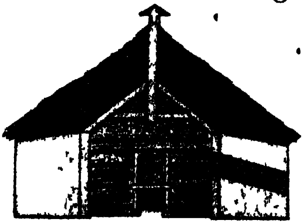
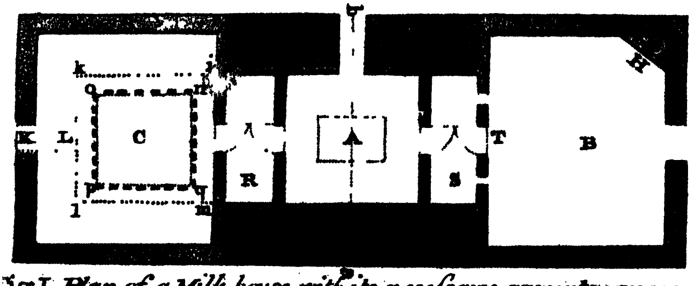


Fig. 2. *Section of a Milk House through the line,* a. b.





ig.I. *Plan of a Milk-house with its neceſsary appurtenances*

ARTICLE VI.

On the Management of the Dairy, particularly with reſpect to the making and curing of Butter.

[By J. ANDERSON, LL.D. F.R.S. and F.S.A.S.]

WHEN a dairy is eſtabliſhed, the undertaker may ſometimes think it his intereſt to obtain the greateſt poſſible *quantity* of produce, ſometimes it may be more beneficial for him to have it of the *fineſt quality*, and at other times it may be neceſſary to have both theſe objects in view, the one or the other in a greater or leſs proportion; it is therefore of importance he ſhould know how he may accompliſh the one or the other of theſe purpoſes, in the eaſieſt and moſt direct manner.

To be able to convert his milk to the higheſt poſſible profit in every caſe, he ought to be fully acquainted with every circumſtance reſpecting the manufacture both of butter and of cheeſe; as it may in ſome caſes happen that a certain portion of that milk may be more advantageouſly converted into butter than into cheeſe, while another portion of it would return more profit if made into cheeſe. It is not, however, intended in the preſent eſſay to *enter into thi[illegible]e diſcuſſion. Here, it is only* propoſed to treat of the manufacture of butter; leaving the ſubject of cheeſe-making to ſome other perſon to treat of, who is more converſant in that department than the author of this eſſay.

The firſt thing to be adverted to in an undertaking of this nature is, to chooſe cows of a proper ſort. Among this claſs of animals, it is found by experience, that ſome kinds give milk of a much thicker conſiſtence, and richer quality than others; nor is this richneſs of *quality* neceſſarily connected with the ſmallneſs of the *quantity* yielded by cows of nearly an equal ſize; it therefore behoves the owner of a dairy to be peculiarly attentive to this circumſtance. In judging of the value of a cow, it ought rather to be the quantity and the quality of the *cream* produced from the milk of a cow in a given time, than the quantity of the milk itſelf. This is a circumſtance that will be ſhewn in the future to be of more importance than is generally imagined. The ſmall cows of the Alderney breed afford the richeſt milk hitherto known; but individual cows in every country may be found, by a careful ſelection, that afford much thicker milk than others; theſe therefore ought to be ſearched for with care, and their breed reared with attention, as being peculiarly valuable.

Few perſons who have had a[illegible]xperience at all in the dairy way can be ignorant, however, that in comparing the milk of two cows, to judge of their reſpective qualities, particular attention muſt be paid to the time that has elapſed ſince their calving; for the milk of the ſame cow is always thinner ſoon after calving, than it is afterwards; as it gradually becomes thicker, though generally leſs in quantity, in proportion to the time the cow has calved. The colour of the milk, however, ſoon after calving is richer than it afterwards becomes; but this, eſpecially for the firſt two weeks, is a faulty colour that ought not to be coveted.

To make the cows give abundance of milk, and of a good quality, they muſt at all times have plenty of food. Graſs is the beſt food yet known for this purpoſe, and that kind of graſs which ſprings up ſpontaneouſly on rich dry ſoils is the beſt of all.*

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* So little attention has hitherto been beſtowed on this ſubject, that I do not know of any ſet of experiments that have ever yet been made, with a view to aſcertain the effects of any of the natural graſſes that ſpontaneouſly ſpring up in abundance on our fiel[illegible]ither on the quantity or the quality of the milk of cows, and few that have been attempted even with regard to thoſe plants that have been cultivated by art as green forage for them; though it be well known that ſome particular kinds of plants ſtrongly affect the taſte, and alter the quality of particular products of milk. It is indeed, in all caſes, confidently

If the temperature of the climate be ſuch as to permit the cows to graze at eaſe throughout the day, they ſhould be ſuffered to range on ſuch paſtures at freedom; but if the cows are ſo much incommoded by the heat as to be prevented from eating through the day, they ought in that caſe to be taken into cool ſhades for protection, where, after allowing them a proper time to ruminate, they ſhould be ſupplied with abundance of green food freſh cut for the purpoſe, and given to them by hand frequently in ſmall quantities freſh and freſh, ſo as to induce them to eat it with pleaſure.* When the heat of

aſſerted, that old paſtures alone can ever be made to afford rich butter or cheeſe. This, however, I know from my own repeated experience to be a popular error, as I have frequently ſeen much richer butter made by one perſon from cows that were fed in the houſe chiefly with cut clover and rye-graſs, than that which was made by others, where the cows were fed on very rich old paſtures. Mankind are in general diſpoſed to throw the blame of every failure upon ſome circumſtance that does not reflect on themſelves as bad managers. Hence it is that the graſs of a farm is often blamed for the want of richneſs of the butter produced upon it; when, if the circumſtances were fully inveſtigated, it would be found to be occaſioned by the unſkilfulneſs of the dairy-maid, or the want of attention in the choice of proper cows.

* In very warm climates, where the heat is extremely oppreſſive to cows, and the flies are exceedingly troubleſome, ſheds open on one ſide, the roof being only ſupported there by pillars, would not afford them ſuch effectual ſhelter as they would require. In theſe caſes, the ſheds ſhould be walled up on both ſides, and be left open only at the two ends, which, if properly placed, would produce a continued ſtream of air throughout the whole building, that would prove highly ſalutary to the cattle.

the day is over, and they ca[illegible]ain abroad with eaſe, they may be again turned into the paſture, where they ſhould be allowed to range with freedom all night during the mild weather of ſummer.

Cows, if abundantly fed, ſhould be milked three times a day during the whole of the ſummer ſeaſon;* in the morning early, at noon, and in the evening, juſt before night-fall. In the choice of perſons for milking the cows, great caution ſhould be employed; for if the operation be not carefully and properly performed, not only the quantity of the produce of the dairy will be greatly diminiſhed, but its quality alſo will be very much debaſed; for if all the milk be not thoroughly drawn from a cow when ſhe is milked, that portion of milk which is left in the udder ſeems to be gradually abſorbed into the ſyſtem, and nature generates no more than to ſupply the waſte of what has been taken away.

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* If cows be milked only twice in the day [24 hours] while they have abundance of ſucculent food, they will yield a much ſmaller quantity of milk in the ſame time than if they be milked three times. Some attentive obſervers I have met with think a cow in theſe circumſtances will give nearly as much milk at *each time*, if milked three times, as if ſhe were milked only twice. This fact, however, has not, that I know of, been aſcertained by experiment. There can be no doubt but they give more, how much is not aſcertained; nor whether it would be advantageous in any caſe to milk them four times, or oftener; or what effect frequent milking produces on the *quality* of the milk.

If this leſſened quantity be not again thoroughly drawn off, it occaſions a yet farther diminution of the quantity of milk generated; and ſo on, it may be made to proceed in perpetual progreſſion from little to leſs, till none at all is produced. In ſhort, this is the practice in all caſes followed, when it is meant to allow a cow's milk to dry up entirely without doing her hurt. In this manner, therefore, the profits of a dairy might be wonderfully diminiſhed; ſo that it much behoves the owner of it to be extremely attentive to this circumſtance, if he wiſhes to avoid ruin. It ought to be a rule without an exception, never to allow this important department to be entruſted, without controul, to the management of hired ſervants.* Its importance will be ſtill more manifeſt from what follows:

In the management of a dairy, the following peculiarities reſpecting milk ought to be very particularly adverted to; ſome of them are, no doubt, known in part to attentive houſewives, but they never yet, I have reaſon to believe, have been adverted to as their importance deſerves; and by many have never been thought of at all. I put them down in the form of aphoriſms, that they may be the more adverted to, and the eaſier retained.

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* Cows ſhould always be treated with great gentleneſs, and ſoothed by mild uſage, eſpecially when young and tickliſh, or when the paps are tender; in which laſt caſe, the udder ought to be fomented with warm water before milking, and touched with the greateſt gentleneſs, otherwiſe the cow will be in danger of contracting bad habits, becoming ſtubborn and unruly, and retaining her milk ever after. A cow never lets down her milk pleaſantly to the perſon ſhe dreads or diſlikes. The udder and paps ſhould always be waſhed with clean water before milking; but care ſhould be taken that none of that water be admitted into the milking pail.

APHORISM I.

Of the Milk that is drawn from any cow at one time, that which comes off at the firſt is always thinner, and of a much worſe quality, than that which comes afterwards, and the richneſs goes on continually increaſing to the very laſt drop that can be drawn from the udder at that time.

Few perſons are ignorant, that milk which is taken from the cow laſt of all at milking, which in this country is called *ſtroakings*, is richer than the reſt of the milk—but fewer ſtill are aware of the greatneſs of the diſproportion between the quality of the firſt and the laſt drawn milk from the ſame cow at one milking. The following facts reſpecting this circumſtance were aſcertained by me many years ago, and have been confirmed by many ſubſequent experiments and obſervations.

Having taken ſeveral large tea-cups exactly of the ſame ſize and ſhape, one of theſe tea-cups was filled at the beginning of the cow milking, and the others at regular intervals till the laſt, which was filled with the dregs of the ſtroakings. Theſe were each weighed, the weight of each cup being ſettled ſo as to aſcertain that the quantity of milk in each was preciſely the ſame; and from a great number of experiments, *frequently* repeated with *many* different cows, the reſult was in all caſes thus:

The quantity of cream obtained from the firſt drawn cup was, *in every caſe*, much ſmaller than from that which was laſt drawn; and thoſe between afforded leſs or more, as they were nearer the beginning or the end. It is unneceſſary here to ſpecify theſe intermediate proportions; but it is proper the reader ſhould be informed, that the quantity of cream obtained from the laſt-drawn cup, from ſome cows, exceeded that from the firſt in the proportion of *ſixteen* to *one*. In other cows, however, and in particular circumſtances, the diſproportion was not quite ſo great; but in no caſe did I find it fall ſhort of the rate of *eight* to *one*. Probably, upon an average of a great many cows, it might be found to run as *ten* or *twelve* to *one*.

2*dly*. The difference in the *quality* of the cream, however, obtained from theſe two cups, was much greater than the difference in the *quantity*. In the firſt cup the cream was a thin tough film, thinner and perhaps whiter than the paper on which I write; in the laſt, the cream was of a thick *butyrous* conſiſtence, and of a glowing richneſs of colour, that no other kind of cream is ever found to poſſeſs.

3dly. The difference in the quality of the *milk* that remained after the cream was ſeparated, was perhaps ſtill greater than either in reſpect to the quantity or the quality of the cream. The milk in the firſt cup was a thin bluiſh liquid, like as if a very large proportion of water had been mixed with ordinary milk; that in the laſt cup was of a thick conſiſtence and yellow colour, more reſembling cream than milk, both in taſte and appearance.

From this important experiment it appears, that the perſon who, by bad milking of his cows, loſes but half a pint of his milk, loſes in fact about as much cream as would be afforded by ſix or eight pints at the beginning, and loſes beſides that part of the cream which alone can give richneſs and high flavour to his butter. Many other uſeful corollaries may be drawn from it, which I do not at preſent ſtop to enumerate. Some of them will occur in the ſequel.

APHORISM

HORISM II.

If milk be put up in a diſh, and allowed to ſtand till it throws up cream, that portion of cream which riſes firſt to the ſurface is richer in quality, and greater in quantity, than what riſes in a ſecond equal portion of time; and the cream that riſes in the ſecond interval of time is greater in quantity and richer in quality than that which riſes in a third equal ſpace of time; and that of the third than the fourth, and ſo on, the cream that riſes decreaſes in quantity, and declines in quality continually, as long as any riſes to the ſurface.

My experiments not having been in this caſe made with ſo much accuracy as in the former, I have not been enabled to aſcertain the difference in the proportion that takes place in equal portions of time; but they have been ſo often repeated as not to leave any room to doubt the fact; and it will be allowed to be a fact of no ſmall importance in the management of the dairy. It is not certain, however, but that a greater *quantity* of cream may upon the whole be obtained from the milk by taking it away at different times, but the proceſs is ſo troubleſome as not to be counterbalanced by the increaſed quantity obtained, if indeed an additional quantity be thus obtained, which is not as yet fully certain.

APHORISM

APHORISM

Thick milk always throws up a ſmaller proportion of the cream it actually contains to the ſurface, than milk that is thinner, but that cream is of a richer quality; and if water be added to that thick milk, it will afford a conſiderably greater quantity of cream than it would have done if allowed to remain pure; but its quality is at the ſame time greatly debaſed.

This is a fact that every perſon attentive to a dairy muſt have remarked; but I have never heard of any experiment that could aſcertain either the preciſe [illegible] of the increaſed quantity of cream that [illegible] be obtained, or of the ratio in the [illegible] quality; but it aſcertains the effects at leaſt of mixing water with the milk in a dairy; and the knowledge of this fact will enable attentive perſons to follow that practice which they think will beſt promote their own intereſt.

O[illegible] V.

Milk which is put into a bucket or other proper veſſel, and carried in it to any conſiderable diſtance, ſo as to be much agitated and in part cooled before it be put into the milk-pans to ſettle for cream, never throws up ſo much nor ſo rich cream, as if the ſame milk had been put into the milk-pans directly after it was milked.

In this caſe, it [illegible]lieved the loſs of cream will be nearly in proportion to the time that has elapſed, and the agitation it has ſuſtained after being drawn from the cow. But I am not as yet in poſſeſſion of any experiments that ſufficiently aſcertain how much is to be aſcribed to the time, and the agitation, taken ſeparately. On every branch of agriculture we find experiments wanting at each ſtep we advance in our enquiries. The labours of no one man can complete the whole; but it is the duty of every enquirer to point out as he goes along where they are wanted.

From the above facts the following corollaries ſeem to be clearly deducible:

1ſt. It is of importance that the cows ſhould be always milked as near the dairy as poſſible, to prevent the neceſſity of carrying and cooling the milk before it be put into the diſhes; and as cows are much hurt by far-driving, it muſt be a great advantage in a dairy farm to have the principal graſs fields as near the dairy, or homeſted, as poſſible.

2dly. The practice of putting the milk of all the cows of a large dairy into one veſſel, as it is milked, there to remain till the whole milking be finiſhed before any part of it is put into the milk-pans, ſeems to be highly injudicious, not only on account of the loſs that is ſuſtained by agitat[illegible]nd cooling, but alſo, more eſpecially, becauſe it prevents t[illegible] owner of the dairy from diſtinguiſhing the good from the bad cow's milk, ſo as to ſeparate theſe from each other, where it is neceſſary. He may thus have the whole of his dairy product greatly debaſed by the milk of one bad cow, for years together, without being able to diſcover it.[*] A better practice therefore would be, to have the milk drawn from each cow ſeparately put into the creaming pans as ſoon as it is milked, without being ever mixed with any other. Thus would the careful *dai*[†] be able on all occaſions to obſerve the particular quality of each individual cow's milk, as well as its quantity, and to know with preciſion which of his cows it was his intereſt to diſpoſe of, and which of them he ought to keep and breed from.

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[*] I once ſaw a cow that gave milk which could never be made to yield any butter at all, though it had the appearance of being very rich milk. The perſon who ſold that cow had had her ſeveral years, along with a good many others, without having ſo much as had any ſuſpicion of this peculiarity. It was only diſcovered when ſhe came into the poſſeſſion of a perſon who had but one cow.

[†] I beg leave here to adopt a provincial word, which is ſtrongly expreſſive, and much wanted in the Engliſh language[illegible]*Dai*, or *dei*, in Aberdeenſhire, denotes the perſon who has the ſuperintendance of a dairy, whether that perſon be male or female. In that ſenſe it is here employed. *Dairy-maid*, which is the only Engliſh word nearly equivalent to it, denotes a perſon of an inferior ſtation, who, under the ſuperintendance of the former, executes the menial offices of the dairy.

3dly. If it be [illegible]ded to make butter *of a very fine quality*, it will be adviſeable in all caſes to keep the milk that is firſt drawn ſeparate from that which comes laſt; as it is obvious that, if this be not done, the quality of the butter will be greatly debaſed, without much augmenting its quantity. It is alſo obvious, that the quality of the butter will be improved in proportion to the ſmallneſs of the proportion of the laſt-drawn milk that is retained, ſo that thoſe who wiſh to be ſingularly nice in this reſpect, will do well to retain only a very ſmall proportion of the laſt-drawn milk.

To thoſe owners of dairies who have profit only in view, it muſt ever be a matter of trial and calculation, how far it is expedient for them to carry the improving of the quality of their butter, at the expence of diminiſhing its quantity. In different ſituations, prudence will point out different kinds of practice as moſt eligible; and all perſons muſt be left, after making accurate trials, to determine for themſelves. It is likewiſe a conſideration of no ſmall importance, to determine in what way the inferior milk that is thus to be ſet apart, where fine butter is wanted, can be employed with the greateſt profit. In the Highlands of Scotland they have adopted, without thinking of the improvement of their butter, a very ſimple and œconomical practice in this reſpect. As the rearing of calves is there a principal object with the farmer, every cow is allowed to ſuckle her own calf with a portion of her milk, the remainder only being employed in the dairy. To give the calf its proportion regularly, it is ſeparated from the cow, and kept in an incloſure along with all the other calves belonging to the ſame farm. At regular times the cows are driven to the door of the calves' incloſure, where the young ones fail not to meet them. Each calf is then ſeparately let out, and runs directly to its mother, where it ſucks till the dairy-maid judges it has had enough, when ſhe orders it to be driven away, having previouſly ſhackled the hinder legs of the mother, by a very ſimple contrivance, to oblige her to ſtand ſtill. Boys drive away the calf with ſwitches, and return it to the incloſure, while the dairy-maid milks off what was left by the calf. Thus they proceed till the whole of the cows are milked, and thus do they obtain a ſmall quantity of milk, it is true, but that milk of an exceeding rich quality; which, in the hands of ſuch of the inhabitants as know how to manage it, is manufactured into the richeſt marrowy butter that can be any where met with. This richneſs of the Highland butter is univerſally aſcribed to the old graſs the cows feed upon in their remote glens, but it is in fact chiefly to be attributed to the *practice here deſcribed, which has long prevailed in theſe regions.** Whether a ſimilar practice could be œconomically adopted elſewhere, I do not take upon me to ſay, but doubtleſs other ſecondary uſes might be found for the milk of inferior quality; on ſome occaſions it might be converted into butter of an inferior quality; on others it might be ſold ſweet, where the ſituation of the farm is within reach of a market-town; on other occaſions it might be converted into cheeſes, which, by being made of ſweet milk, would be of a very fine quality if carefully made;† and ſtill other uſes might be deviſed for

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* And perhaps in ſome meaſure to the nature of the beaſt.

† The making of cheeſe has never yet been reduced to ſcientifical principles, and conſequently the reaſoning relating to it is very inconcluſive. It is in general ſuppoſed that the goodneſs of cheeſe depends almoſt entirely upon its richneſs, by which is meant the proportion of oily matter, whether natural or extraneous, it contains; nothing however is more certain, than that this opinion is erroneous. Sometimes a very lean cheeſe is much better taſted than one that is much fatter; and, which will appear to moſt perſons ſtill more extraordinary, it frequently happens that a cheeſe that taſtes ſoft and fat, is much leaner than one that is hard, dry, and ſticky. The mode of manufacturing it occaſions this, and not the quantity of cream it contains. It is very poſſible, by art, to make poor ſkim-milk cheeſe aſſume the ſoft buttery taſte and appearance, even of cream-cheeſes. This ſubject, therefore, deſerves highly to be more particularly elucidated than it hitherto has been.

Connected as it is with the object diſcuſſed in the text, I beg leave to ſuggeſt the following particulars, as a proper object of examination and experiment, viz. Is the quantity of caſeous matter afforded by milk *for its application, which I now ſtop to enumerate.**

milk neceſſarily connected with the proportion of cream that milk contains, or does it depend upon ſome other principle not hitherto inveſtigated? Without pretending to decide on this queſtion, I feel myſelf ſtrongly inclined to believe it does not depend upon the quantity of cream. It is well known that cow's milk, which always throws up more cream, and that of a much richer quality than ewe milk, does in no caſe afford above one half the proportion of cheeſe that ewe milk does. Nor can this ſingular tendency of ewe milk, to yield a great proportion of curd, be attributed to its ſuperior thickneſs; for cow milk can be often had that is thicker and richer than ewe milk, but it always affords a much ſmaller proportion of curd. From theſe conſiderations, it is not impoſſible, but it might be found upon a careful inveſtigation, that the refuſe milk, which ought to be ſeparated from the other in making the beſt butter, might be equally proper, or very nearly ſo, for making cheeſes, as if no ſuch ſeparation had been made. I therefore recommend this as a proper object of experimental enquiry.

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* I ſhall here mention one mode of managing milk, by means of which the inferior kinds of it might, on many occaſions, eſpecially within reach of towns, be diſpoſed of to great advantage. Take common ſkimmed milk when it has begun to turn ſour, put it into an upright ſtand churn, or a barrel with one of its ends out, or any other convenient veſſel. Heat ſome water, and pour it into a tub that is large enough to contain with eaſe the veſſel in which the milk was put. Set the veſſel containing the milk into the hot water, and let it remain there for the ſpace of one night. In the morning it will be found that the milk hath ſeparated into two parts, a thick cream-like ſubſtance which occupies the upper part of the veſſel, and a thin ſerous watery part, that remains in the bottom; draw off the thin p[illegible]called here *wigg*) by opening a ſtop-cock placed for that purpoſe cloſe above the bottom, and reſerve the cream for uſe. Not much leſs than the half of the milk is thus converted into a ſort of cream, which, when well made, ſeems to be as rich and fat as real cream itſelf, and is only diſtinguiſhable from that by its ſourneſs. It is eaten with ſugar, and

4thly. If the quality of the butter be the chief object attended to, it will be neceſſary not only to ſeparate the firſt from the laſt drawn milk, but alſo to take nothing but the cream that is firſt ſeparated from the beſt milk, as it is this firſt riſing cream alone that is of the prime quality. The remainder of the milk, which will be ſtill ſweet, may be either employed for the purpoſe of making ſweet milk cheeſes, or it may be allowed to ſtand to throw up cream for making butter of an inferior quality, as circumſtances may direct.

5thly. From the above facts, we are enabled to perceive that butter of the very beſt poſſible quality can only be obtained from a dairy of conſiderable extent, when judiciouſly managed; for when only a very ſmall portion of each cow's milk can be ſet apart for throwing up cream, and when only a very ſmall proportion of that cream can be reſerved as of the prime quality, it follows, that, unleſs the quantity of milk were upon the whole very conſiderable, the quantity of prime cream produced would be ſo ſmall as to be ſcarcely worth the while for manufacturing ſeparately.

eſteemed a great delicacy, and uſually ſells at double the price of freſh unſkimmed milk. It requires practice, however, to be able to make this nicely; the degree of the heat of the water, and many other circumſtances, greatly affecting the operation. Theſe things practice beſt diſcovers.

6thly. From theſe premiſes [illegible] are alſo led to draw another concluſion, extremely different from the opinion that is commonly entertained on this ſubject; viz. That it ſeems probable that the very beſt butter could only be with œconomy made in thoſe dairies where the manufacture of cheeſe is the principal object. The reaſons are obvious:—If only a ſmall portion of the milk ſhould be ſet apart for butter, all the reſt may be made into cheeſe while it is yet warm from the cow and perfectly ſweet; and if only that portion of cream which riſes during the firſt three or four hours after milking is to be reſerved for butter, the rich milk which is left after that cream is ſeparated, being ſtill perfectly ſweet, may be converted into cheeſe with as great advantage nearly as the newly-milked milk itſelf.

But as it is not probable that many perſons could be found, who would be willing to purchaſe the very fineſt butter made in the manner above pointed out, at the price that would be ſufficient to indemnify the farmer for his trouble in making it; theſe hints are thrown out merely to ſatisfy the curious in what way butter poſſeſſing this ſuperior degree of excellence may be obtained, if they chooſe to be at the expence; but for an ordinary market, I am ſatisfied, from experience and attentive obſervation, that if

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in general about the firſt drawn *half* of the milk be ſeparated at each milking, and the remainder only be ſet up for producing cream, and if that milk be allowed to ſtand to throw up the whole of its cream, even till it begins ſenſibly to taſte ſouriſh, and if that cream be afterwards carefully managed, the butter thus obtained will be of a quality greatly ſuperior to what can uſually be obtained at market, and its quantity not conſiderably leſs, than if the whole of the milk had been treated alike.* This, therefore, is the practice that I ſhould think moſt likely to ſuit the frugal farmer, as his butter, though of a ſuperior quality, could be afforded at a price that would always inſure it a rapid ſale.

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* Among other reaſons that induced me to ſeparate about the half of the milk, the following may be ſtated. Whilſt I was employed in making the experiments on milk abovementioned, it chanced that among my cows there was one which had miſſed having a calf that ſeaſon, and ſtill continued to give milk, (a cow in theſe circumſtances we here call a *farrow* or *farra* cow.) Her milk, as is not uncommon in theſe circumſtances, taſted ſenſibly ſalt. On trying the different parcels of that milk, however, it was perceived that the firſt-drawn milk was extremely ſalt to the taſte, and that the laſt was perfectly ſweet. On an after trial made with a view to aſcertain what proportion of the milk was ſalt, it was found that the ſaltneſs decreaſed gradually from the beginning, and was entirely gone when nearly one half of the milk was drawn off, [illegible] that all the laſt-drawn half of the milk was quite ſweet. I intended to have tried if other nauſeous taſtes that ſometimes affect milk, ſuch as that from turnips, cabbages, &c. were peculiarly confined to the firſt-drawn milk or not; but other avocations prevented me from aſcertaining this fact.

From theſe general obſervations on milk, it is neceſſary we ſhould proceed to particulars. No dairy can be managed with profit, unleſs a place properly adapted for keeping the milk, and for carrying on the different operations of the dairy, be firſt provided. The neceſſary requiſites of a good milk-houſe are, that it be cool in ſummer, and warm in winter, ſo as to preſerve a temperature nearly the ſame throughout the whole year; and that it be dry, ſo as to admit of being kept clean and ſweet at all times. As it is on moſt occaſions difficult to contrive a place within the dwelling-houſe that can poſſeſs all theſe requiſites, I would adviſe that a ſeparate building ſhould be always erected, which, upon the plan I ſhall now deſcribe, may in every ſituation be reared at a very ſmall expence, and will anſwer the purpoſe much better than any of thoſe expenſive ſtructures I have ſeen, that were built by noblemen or gentlemen for this uſe.

This ſtructure ought, if poſſible, to be erected near to a cool ſpring, or running water, where eaſy acceſs can be had to it by the cows, and where it is not liable to be incommoded by ſtagnant water. It ſhould conſiſt of a range of narrow buildings as in the plan;* that diviſion in the middle, marked A, being the milk-houſe properly ſo called. The walls of this building ſhould [illegible] reared of brick, or of ſtone and lime, all round the inſide; this wall need not exceed in thickneſs one brick in length, or if of ſtone, about one foot thick; beyond that, the wall which is full ſix feet in thickneſs, ſhould be made of ſod on the outſide, and earth rammed firm within that. The inſide wall of this building may be ſeven or eight feet high in the ſides, on which may be placed the couples to ſupport the roof, and the walls at the gabels carried up to the height of the couples. Upon theſe ſhould be laid a roof of reeds, or thatch, that ſhould not be leſs than three feet in thickneſs, which ſhould be produced downward till it covers the whole of the walls on each ſide; but here, if thatch or reeds be not in ſuch plenty as could be wiſhed, there is no occaſion for laying it quite ſo thick. In the roof, exactly above the middle of the building, ſhould be placed a wooden pipe of a ſufficient length to riſe a foot or two above the roof, to ſerve occaſionally as a ventilator. The top of this funnel ſhould be covered, to prevent rain from getting through it, and a valve fitted to it, that by means of a ſtring could be opened or ſhut at pleaſure. A window alſo ſhould be made upon one ſide for giving light, the ſtructure of which will be beſt underſtood from the ſection of this part of the building, which is repreſented at Fig. 2. F. G. It is neceſſary to ſpecify, however, that this aperture ſhould be cloſed by means of two glazed frames, one on the outſide at G, and the other on the inſide at F. I preſume it is hardly neceſſary to inform the reader, that the uſe of this double ſaſh, as well as the great thickneſs of the wall, and of the thatch upon the roof, as alſo of the buildings at the end of it, are to render the temperature of this apartment as equal as poſſible at all ſeaſons of the year, by effectually cutting it off from having any direct communication with the external air.

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* See the plate annexed.

The apartment marked B, is intended to ſerve as a repoſitory for the utenſils of the dairy, and a place in which they may be cleaned, and put in order, to be ready when they are wanted. For this purpoſe ranges of ſhelves may be placed all round the walls, and tables and other conveniences placed where neceſſary. Here the walls are thinner than the other, and may be built wholly of brick or ſtone; nor is there a neceſſity for having the thatch here ſo thick laid on as in the middle diviſion. In one corner at H, is placed a cauldron of a convenient ſize proportioned to the dairy, for warming water to ſcald the veſſels, over a cloſe furnace, the flue of which terminates in a chimney carried ſlanting over the door in the gabel, above which it riſes upright, and there emits the ſmoke.

The other apartment, C, may be employed as a kind of ſtore-room, in which the cured butter, and other products of the dairy, and ſpare utenſils, may be locked up, till it becomes convenient to tranſport them elſewhere.*

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* If the dairy be ſituate ſo near a town as that ice could be diſpoſed of with profit in ſummer, it might be very uſeful to convert this apartment into an ice-houſe, which would be on many occaſions a very convenient appendage of the dairy. All that would be neceſſary in this caſe, would be to build the walls in the ſame manner, and make them of the ſame thickneſs, with thoſe of the apartment A, as marked by the dotted lines i, k, l, m. The thatch being alſo laid on to the ſame thickneſs. If this were intended, firm poſts of wood ought to be placed in the floor, as marked in the plan, n, o, p, q, ſo as to form an inner ſquare, with an open walk all round of two feet in breadth. Within theſe poſts ſhould be placed hurdles of a convenient ſhape, formed of wicker work. The wands of which they are made having been all peeled, and previouſly dipped in warm coal tar, to preſerve them from rotting. Within this ſquare is the receptacle for the ice. The ice-houſe to be filled by opening the double doors at K.L. which ſhould then be cloſed, not to be opened till it was again to be filled, and the aperture between them to be filled with ſtraw rammed firm, to prevent the admiſſion of air by that means. The ice to be taken out occaſionally, as it may be wanted, through the milk-houſe.

Many would be the conveniences the dairy would derive from this accommodation, and ſmall the expence. By means of it, the products of the dairy could be always cooled to the degree in ſummer that ſhould be found to give them their greateſt perfection. Other advantages might occaſionally be derived by the attentive farmer from this eaſily obtained accommodation; one of which I ſhall here mention:

BEES in this climate are found to be a very precarious kind of ſtock, though, where they do thrive, they are extremely profitable. The circumſtance that chiefly occaſions their failure here, is the variableneſs of our climate. In winter we have often mild warm days, little inferior

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[If cheeſe were the object of the dairy, another additional building, very differently conſtructed, would be wanted, which I do not here ſpecify.]

The ſmaller apartments, R and S, are merely cavities formed in the thickneſs of the partition wall, that may be employed for any uſe that ſhall be found convenient, the double doors on theſe paſſages being intended merely to cut off more effectually all communication between the external air and the milk-houſe, when either the great heat

to that we experience in ſummer; and in the ſpring eſpecially, it frequently happens that a warm morning is ſuddenly changed to a nipping froſt, or ſleety rain. During theſe mild intervals in winter, the bees are rouſed from their ſleepy ſtate, and being unable to get any food abroad, they are under the neceſſity of conſuming the ſtores they had provided for themſelves, which being ſoon exhauſted they then periſh for want. In the ſpring alſo, when they are invited abroad by the warmth of the weather, they in vain ſearch for flowers from which they might derive nouriſhment, and are frequently chilled by the cold, before they can return to the hive. No mode that can be conceived is ſo effectual to prevent theſe accidents, as that of putting them into an ice-houſe in the beginning of winter, where they might be kept till the ſpring was ſo far advanced as that little danger was to be apprehended from bad weather. During all this time they would remain in a ſtate of torpor, ſo as to have no need of food, and would be ready to begin their labours with vigour in the ſpring, when the mild weather invited them abroad. Some will think that the cold of an ice-houſe would make them periſh entirely; but bees often experience in Ruſſia and Poland a degree of cold that is ſufficient to freeze even quickſilver, without being killed, which is ſo much beyond any cold that ever takes place in a Britiſh ice-houſe, as leaves no room for anxiety on that head.

or great cold of that may render it neceſſary. The thatch above theſe ſmall apartments ought to come one foot lower within than in the milk-houſe, the more effectually to bar all communication of air from the outer apartments, at the place where the couples are placed. When the air is temperate, the door at T. may in general be left open to facilitate the entry to and from the milk-houſe on ordinary occaſions. All the doors open as marked by the dotted lines.

Through each of theſe doors, as well as the outer doors of the apartments B and C, ought to be made an aperture of about a foot ſquare, having a ſmall door exactly fitted to it, that can be opened and ſhut at pleaſure. Over the inſide of each of theſe apertures ſhould be ſtretched a piece of fine gauze covered with a fine netting of wire, ſo that when the air was temperate, and the wind blowing in a proper direction, by opening theſe little doors, a draught of air would be carried through the whole of theſe buildings that would keep them ſweet and dry, without admitting flies or other vermin.

The walls of theſe apartments ſhould be neatly plaiſtered with lime on the inſide of the walls and cieling. The apartment A at leaſt ſhould alſo be paved with flat ſtones, that ſhould be raiſed ſix inches higher than the ſurface of the ground without, having ſlanting gutters readily to convey water or any other liquid that might be accidentally ſpilt there, (but it is a ſlovenly dairy-maid who ſlabbers her floor.) The walls all round ſhould be lined with ſhelves of a convenient breadth in ranges one above the other, on which the diſhes may be placed; and in the middle ſhould ſtand a large table, marked by the dotted lines on the plan, which if made of ſtone will be found to be more cleanly and convenient than any other material. Beneath it a piece of the pavement, about a foot in breadth, ſhould be raiſed ſix inches higher all round than the level of the floor, ſo as to form a trough within it for holding water, the uſes of which will be afterwards ſpecified. This baſon may be emptied entirely at pleaſure, by opening a hole that allows the water to run into the common gutters.

The intention of all theſe contrivances, it will eaſily appear, is merely to enable the attentive owner of a dairy to keep his milk in a proper degree of temperature, both during the ſummer and the winter ſeaſon, without much trouble or expence to himſelf; as any conſiderable variation in the degree of heat tends greatly to derange his operations, and to diminiſh the value of the products of the dairy. If the heat be too great, the milk ſuddenly coagulates, without admitting of any ſeparation of the cream, and it is ſo ſuddenly rendered ſour as greatly to marr every operation; if, on the other hand, the milk be kept in too cold a temperature, the cream ſeparates from it ſlowly and with difficulty, it acquires a bitter and diſagreeable taſte, the butter can ſcarcely be made to come at all, and when it is obtained is ſo pale in the colour, ſo ſmall in quantity, ſo poor to the taſte, hard and brittle of conſiſtence, and of ſo little value in every reſpect, as to bring a very low price at the market, compared to what it would have produced had it been preſerved in a proper degree of warmth. To avoid, therefore, as much as poſſible, both theſe extremes, the milk-houſe, properly ſo called, is here placed in the centre of the building, into which there is no acceſs directly from the open air; nor even from the porch, but through a double door, one of which ought always to be ſhut before the other be opened, when either the heat or the cold of the weather is exceſſive, though at other times this precaution may be omitted. The walls of this part of the building are made of earth ſo thick, and the roof of thatch ſo thick alſo, as directed, becauſe it is found theſe ſubſtances tranſmit heat or cold with leſs facility than any others that can eaſily be had, ſo that a very long continuance either of hot or cold weather, would have no ſenſible effect in altering the temperature of this chamber; and if it ſhould at any time acquire a ſmall degree of heat [illegible] cold more than was deſirable, and this were corrected by artificial means, it would retain that artificial temperature for a long time. Theſe are the advantages propoſed to be derived from this ſimple mode of conſtruction.

Experiments have not yet been made to aſcertain what is the preciſe degree of heat that is the moſt favourable for the different operations of the dairy. From the trials I have made myſelf, I have reaſon to believe, that when the heat is from 50 to 55 degrees on Fahrenheit's thermometer, the ſeparation of the cream from milk, which is the moſt important operation of the dairy, goes forward with the greateſt regularity. I am therefore inclined to think, that this will be found to be the temperature that ought to be aimed at in the dairy; but I do not here pretend to decide with a dogmatick preciſion; a conſiderable degree of latitude in this reſpect may perhaps be allowable; but from the beſt obſervations I have been able to make, it ſeems to me highly probable, that when the heat exceeds 60 degrees, the operations become difficult and dangerous, and when it falls below the 40th degree, they can ſcarcely be carried forward with *any degree* of œconomy or propriety. Till farther experiments, therefore, ſhall aſcertain this point, we may take it as a ſafe rule, that the heat ſhould be kept up, if poſſible, between the 50th and 55th degree; and to aſcertain this point, a thermometer, graduated by Fahrenheit's ſcale, ſhould be hung up perpetually in the milk-houſe, to give notice to the owner of any alterations in the temperature that might affect his intereſt. Luckily it happens that this is very nearly about the average temperature that a building, ſo well ſecured as this is from the external air, would naturally bear at all ſeaſons of the year in this climate, were it not to be affected by external objects. But as the heat of the milk, if it were in conſiderable quantities, would tend in ſummer to affect the temperature of the air, there is no impoſſibility but it might thus be raiſed on ſome occaſions to a higher degree than was proper. It was to have at all times at hand an eaſy cure for this diſorder that I wiſhed to call in the aſſiſtance of the ice-houſe, as a ſmall quantity of ice, brought into the milk-houſe at any time, would quickly moderate the heat to a proper degree. In the two ſmall chambers adjoining to the ice-houſe too, or in the paſſages around the ice-houſe, the butter would be kept even cooler than in the milk-houſe itſelf. Other advantages that would ariſe from this ſmall additional building will appear obvious.

In winter, ſhould the cold ever become too great, it might be occaſionally diſpelled, either by placing a barrel full of hot water, cloſe bunged up, upon the table, where it might be allowed to remain till it cooled—or ſome hot bricks might be employed for the purpoſe. This I ſhould prefer to any kind of chaffing-diſh, with burning embers in it, as the vapour from the coals (which very ſoon affects the taſte of the milk)* would thus be avoided.

The next object that demands attention is, the utenſils of the dairy. Theſe in general muſt, from the nature of the buſineſs, be made of wood. But of late many perſons, who affect a ſuperior degree of elegance and neatneſs, have employed veſſels made of lead, or of common earthen-ware, for various purpoſes in the dairy. But, as the acid of milk very readily diſſolves lead, braſs, or copper, and with theſe forms a compound of a poiſonous nature; ſuch veſſels muſt be accounted highly pernicious in the dairy, and therefore ought to be baniſhed from it. The ſame may be ſaid of veſſels of any of the common kinds of earthen ware, which being glazed with lead, and the glazing ſoluble in acid, are equally improper. Mr. Hayes has recommended caſt-iron as a proper ſubſtitute for theſe; but this metal alſo is ſoluble in acids; and though the ſolution be not poiſonous like the others, yet, as it may affect the taſte of the products of the dairy, and render their medical qualities different from what they would naturally have been, the uſe of theſe alſo ſhould be laid aſide. In ſhort, excepting veſſels of true porcelain, or glaſs, which are greatly too expenſive, I know of none that could be with propriety ſubſtituted for wooden veſſels, in the dairy. China or glaſs veſſels, however, for obvious reaſons, can never come into general uſe in the dairy; nor will the ſenſible huſbandman ever think of any other than wooden diſhes for his milk; as theſe, if properly managed, can be kept as ſweet and pure as the imagination can conceive. This fact is ſo generally known as to render wooden dairy utenſils common in moſt parts of the country, ſo as that they can be readily procured every where of a proper quality, and form of conſtruction, and therefore nothing more on this ſubject need be here ſaid.

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* Where a houſe is not well accommodated with *cellars*, it is ſufficiently obvious that they might be built upon the ſame plan, and thus at a ſmall expence might be reared, cellars that would be, in every reſpect, as good as the beſt vaults ſunk deep under ground.

The creaming diſhes (ſo I call the veſſels in which the milk is placed for throwing up cream) when properly cleaned, ſweet, and *cool*, are to be filled with the milk as ſoon after it is drawn from the cow as poſſible, having been firſt ſtrained carefully through a cloſe ſtrainer, formed of a large wooden bowl with a hole at the bottom covered with a very cloſe ſieve of fine wire, (ſilver wire is beſt) or hair web woven for that purpoſe; or thin cloth of any kind, (I ſhould always prefer the wire, as moſt durable and cleanly) ſo as to keep back hairs, &c. that may accidentally fall from the cow. Theſe diſhes ſhould never exceed three inches in depth, whatever be their other dimenſions; and if the plan recommended above of ſeparating the milk into two parts, and of keeping each cow's milk by itſelf, ſhall be followed, it would be convenient to have them made of ſuch dimenſions as to contain about one and a half or two gallons Engliſh. As ſoon as they are filled they are to be placed on the ſhelves in the milk-houſe, where they ſhould be allowed to remain perfectly undiſturbed till it be judged expedient to ſeparate the cream from them.

The length of time that ſhould elapſe before the cream be ſeparated, will depend upon the degree of heat at the time, and the particular views of the owner of the dairy. In a moderately warm temperature of the air, if very fine butter be intended, it ſhould not be allowed to ſtand more than ſix or eight hours. For ordinary good butter it may ſafely be let ſtand twelve hours, or more; but where the dairy is ſo large as to afford a ſufficient quantity of cream, and where the very beſt butter is intended, (the milk being to be converted to ſome other uſe while yet ſweet) it may be ſeparated after ſtanding *only two, three, or four hours.*

When the cream is to be ſeparated, the milk-pan ſhould be taken from the ſhelf, and placed on the table. The cream is then to be ſeparated from the edges of the veſſel, to which it firmly adheres, by means of a knife with a blunt edge provided for that purpoſe, (the blade formed either of *pure* ſilver or of fine ivory) which ſhould be made to run round the edges of the whole. The cream is then to be carefully drawn towards one ſide by means of a ſkimming-diſh, and then lifted up with great nicety ſo as to take the whole without any of the milk, if poſſible. This requires a dexterity of manipulation* that can be acquired by practice alone; but it is of great importance to the ſucceſs of the dairy that it be well done, for if any part of the cream be left, the *quantity* of butter will be diminiſhed, and if any part of the milk be taken, its quality will be debaſed. The wooden ſkimming-diſhes commonly employed, ſeem not to be ſo handy for this purpoſe as could be wiſhed. An improvement on this apparatus might be ſuggeſted, but this I decline at preſent to enlarge upon.

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* This may be accounted a cramp word, but it expreſſes the idea intended ſo much better than *operation* or *proceſs*, or any other word in common uſe, that I could not think of rejecting it; and hope it will ſoon come to be as generally uſed as any other word in the language.

When the cream is thus obtained, it ought to be immediately put into a veſſel by itſelf, there to be kept till a proper quantity be collected for being made into butter: and no veſſel can be better adapted for that purpoſe than a firm neat-made wooden barrel, in ſize proportioned to the extent of the dairy, open at one end, with a lid exactly fitted to cloſe it. In the under part of this veſſel, cloſe to th[illegible]ld be placed a cock or ſpigot, for drawing [illegible] time to time any thin ſerous part of the milk [illegible] may chance to be there generated; for ſhould this [illegible] allowed to remain, it acts upon the cream in a powerful manner, and greatly diminiſh the richneſs of the quality of the butter. The inſide of the opening of the barrel ſhould be covered with a bit of cloſe fine wire (ſilver) gauze netting to keep back the cream, while the ſerum is allowed to paſs; and the veſſel on its ſtand ſhould be inclined a little forward in the top to allow the whole to run off.

Many perſons who have had little experience in the dairy believe, that no butter can be of the fineſt quality, except that which has been made from

cream

cream that has not been kept above one day; but this is a very great miſtake. So far indeed is this opinion from being well founded, that it is in very few caſes that even tolerably good butter can be obtained from cream that is not more than one day old. The ſeparation of butter from cream only takes place after the cream has attained a certain degree of acidity. If it be agitated before that acidity has begun to take place, no butter can be obtained, and the agitation muſt be continued till the time that that ſourneſs is produced, after which the butter begins to form. In ſummer, while the climature is warm, the beating may be, without very much difficulty, continued until the acidity be produced, ſo that butter may be got; but in this caſe the proceſs is long and tedious, and the butter is, for the moſt part, of a ſoft conſiſtence, and tough and gluey to the touch. If this proceſs be attempted during the cold weather in winter, butter can ſcarcely be in any way obtained, unleſs by the application of ſome great degree of heat, which ſometimes aſſiſts in producing a very inferior kind of butter, that is white, hard and brittle, with very little taſte, and almoſt unfi[illegible]r any culinary purpoſe whatever.

The judicious farmer, therefore, will not attempt to imitate this practice, but will allow his cream to remain in the veſſel appropriated for keeping it, until it has acquired that proper degree of acidity that fits it for being made into butter with great eaſe, by a very moderate degree of agitation, and by which proceſs only very fine butter ever can be obtained.

How long cream ought to be kept before it attains the preciſe degree of acidity that is neceſſary to form the very beſt butter, and how long it may be kept after that period before its quality be ſenſibly diminiſhed, has never yet, I preſume, been aſcertained by any experiments that can be relied on. So little nicety has been obſerved in this reſpect by practical farmers, even thoſe who have a high reputation for making good butter, that few of them ever think of obſerving any preciſe rule in this reſpect with regard to the different portions of their cream, ſeeing they in general make into butter all the cream they have collected ſince the former churning, ſo that the new and the old is all beaten up together; and I can find nothing like a uniform rule eſtabliſhed among them as to the time that ſhould intervene between one churning and another, that being uſually determined by local or accidental circumſtances. I am, myſelf, inclined to believe, that if the cream be carefully kept, and no ſerous matter allowed to lodge about it, a very great latitude may ſafely be admitted in this reſpect. How long cream may be thus kept in our climate, without rendering the butter made from it of a bad quality, I cannot ſay; but I can ſay with certainty, that it may be kept good for a much longer time than is in general ſuſpected, even a great many weeks. It is however certain, that cream, which has been kept three or four days in ſummer, is in excellent condition for being made into butter; and I am inclined to believe, that from three days to ſeven may be found in general to be the beſt time for keeping cream before churning; though, if circumſtances make it neceſſary, a conſiderable latitude in this reſpect may be allowed.

If, however, it ſhould chance that any farmer has ſuch a quantity of cream as might be worth his while to churn once every day, there is nothing to prevent him from doing it. He has only to provide a ſeparate veſſel for holding the cream for each day he means it ſhould ſtand before churning; if three days, three veſſels; if four days, four veſſels; and ſo on. Thus he might churn every day cream of three days old, or of four, or any other number of days old that he might incline. In the ſame manner, if it were found that the cream of two, of three, or of a greater number of days gathering, was required to make a proper churning, it might be eaſy ſo to contrive it as to churn every day, as will be obvious to any one who ſhall think upon the ſubject. In this way the operations of a dairy may be kept perfectly regular and eaſy.*

The veſſel in which butter is made, uſually called a *churn*, admits, in the form of it, a conſiderable diverſity. The ſimpleſt that I have ſeen I ſhould prefer as the beſt, merely becauſe it admits of being better cleaned, and of having the butter more eaſily ſeparated from the milk, than any of the others; this is the old-faſhioned upright churn, having a long handle with a foot to it perforated with holes, for the purpoſe of beating the cream, by being moved upward and downward by hand. But though, for the reaſons aſſigned, I ſhould prefer that form of a churn, other perſons may chooſe that which they like beſt, as all the ſorts, under ſkilful management, will perform the buſineſs perfectly well. Indeed, if the cream be prepared as above directed, the proceſs of churning will be ſo eaſy, as to render thoſe utenſils in general the moſt commodious which can be moſt eaſily filled and emptied.

* Some perſons chooſe to churn the whole of the milk without ſeparating any part of the cream. In this way they obtain a greater quantity of butter, though of an inferior quality. By careful management, however, eſpecially if a portion of the firſt-drawn milk be ſeparated, very good butter may be obtained; but I think the practice, on many accounts, is not to be recommended.

In the proceſs of churning much greater nicety is required than moſt perſons ſeem to be aware of. A few haſty irregular ſtrokes may render the whole of the butter of ſcarcely any value, that, but for this circumſtance, would have been of the fineſt quality. The owner of an extenſive dairy, therefore, ſhould be extremely attentive to this circumſtance, and ſhould be at great pains to procure a proper perſon for managing this branch of buſineſs. This perſon ought to be of a cool phlegmatick temper, ſedate diſpoſition and character, and ought never to allow another perſon, eſpecially thoſe who are young, to touch the churn, without the greateſt caution and circumſpection. Thoſe who have been uſed to ſee cream churned that has not been properly prepared, will think, perhaps, that this would be ſevere labour in a large dairy for one perſon; but nothing is more eaſy, as to the bodily labour it requires, than the proceſs of butter-making, where the cream has been duly prepared.

The butter when made muſt be immediately ſeparated from the milk, and being put into a clean diſh, (the moſt convenient ſhape is that of a ſhallow bowl) the inſide of which, if of wood, ſhould be well rubbed with common ſalt, to prevent the butter from adhering to it; the butter ſhould be preſſed and worked with a flat wooden ladle, or ſkimming diſh, having a ſhort handle, ſo as to force out all the milk that was lodged in the cavities of the maſs. A conſiderable degree of ſtrength, as well as of dexterity, is required in this manipulation. The thing wanted is to force out the milk entirely, with as little tawing of the butter as poſſible; for if the milk be not entirely taken away, the butter will infallibly ſpoil in a ſhort time, and if it be much worked, the butter will become tough and gluey, which greatly debaſes its quality. This butter is in ſome places beaten up by the hand, which I conſider as an indelicate and barbarous practice.

Some perſons employ cold water in this operation, which they pour upon the butter, and thus, as they ſay, waſh it; but this practice is not only uſeleſs, as the butter can be perfectly cleared of the milk without it, but alſo pernicious, becauſe the quality of the butter is thus debaſed in an aſtoniſhing degree. Nothing is ſo hurtful in a dairy as water improperly uſed, which, if mixed in any way with either milk or butter, tends greatly to debaſe the quality of the laſt.

When the butter is entirely freed from the milk, if it is to be ſold ſweet, it may be made up into any form that is moſt generally liked at the market where it is to be ſold. If the heat ſhould be ſo great as to render it too ſoft to receive the impreſſion of the mould, it may be put into ſmall veſſels, which may be allowed to ſwim in the trough of cold water under the table, but without allowing any of that water to touch the butter;* there it will in a ſhort time acquire the neceſſary degree of firmneſs, (eſpecially if a little bit of ice ſhall have been put into the baſon) after which it may be taken out and moulded into proper form. It ſhould then be put down, in proper diſhes, upon the ſtone border that ſurrounds the trough, where it may be kept cool and firm till it be packed up to go to market.

In every part of the foregoing proceſs it is of the utmoſt importance that the veſſels, and every thing elſe about the dairy, be kept perfectly clean and ſweet, for without this precaution there neither can be pleaſure nor profit derived from it. This is a circumſtance ſo univerſally admitted, that it may ſeem ſuperfluous to take notice of it in this place. Yet though this be generally known and admitted, and though every perſon who attempts to manage a dairy of any ſort may intend to have things clean and proper, they may nevertheleſs be, in ſome caſes, at a loſs for the proper way of effecting their intentions, or of guarding againſt certain evils, which, if once allowed to take place in the dairy, will not be eaſily removed. Some hints, therefore, are ſubjoined in a note that may be of ſervice to thoſe who are not well acquainted with this department of buſineſs.*

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* The practice that prevails in many private families of keeping the ſweet butter among water in a cryſtal veſſel, and thus ſerving it up to table, is for the ſame reaſon much to be cenſured. If coolneſs only is wanted, it were better to put the butter in a dry glaſs, and put that into a larger one among water. If it were taken out of that immediately before it were put upon the table, it would always have firmneſs enough in our climate.

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* As ſoon as the cream is ſeparated from the milk, the diſhes ſhould be carried out of the milk-houſe, and immediately emptied, and the ſkimmed milk applied to the uſes that the owner of the dairy judges to be moſt advantageous to him. As ſoon after the diſhes are emptied as poſſible, they muſt be well waſhed with ſcalding hot water, which ſhould be kept in readineſs for that purpoſe; and as the naked hand cannot be put among the ſcalding water, a ſcrubbing-bruſh of a proper conſtruction muſt be kept in readineſs for that uſe. This may be made of a bunch of wire, firmly bound up with ſtrong packthread, where other materials cannot be had; but the ſtumps of an old heath-beſom, after the ſmall twigs have been worn off, firmly bound together, are found to anſwer this purpoſe remarkably well, nor ought any thing elſe to be ſought for where that can be had, for this is both firm and tough, ſo as to ſtand the work extremely well.

After the diſhes have been thus perfectly ſcalded, and thoroughly ſcrubbed in every part, they muſt be carefully rinſed with blood-warm water, and well ſcoured by hand with a coarſe linen cloth. They are then to be turned down one by one as they are finiſhed bottom upwards, upon a clean ſhelving board to drip. When the whole are gone over in this way, the dairy-maid returns to the firſt done, and with a dry cloth wipes them one by one as clean as poſſible. They are then placed in ranges, ſo as to be expoſed fully to the action of the ſun and air on the inſide, that the whole of the moiſture may be dried up as quickly as may be; for nothing tends ſo ſoon to deſtroy the ſweetneſs that is ſo deſirable in dairy veſſels as for the moiſture to be allowed to remain long about them. Therefore, in dull foggy weather, when this cannot

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On ſome occaſions a part, or the whole, of the butter may, perhaps, be diſpoſed of freſh; but in general

be quickly dried up by the external air, it is neceſſary to do it by the aid of fire in the houſe. As ſoon as the diſhes are thoroughly dried, they muſt be carried into the ſhade, and placed in order on ſhelves to cool, to be in readineſs for uſe when they ſhall be again wanted.

But ſhould the milk have been ſuffered at any time to remain ſo long in the diſh as to become ſour, the wood inſtantly becomes tainted with that acidity, ſo as to act as a leaven upon any milk that ſhall be afterwards put into it, which never fails to coagulate without ſeparating any cream, and can neither be employed in making butter nor cheeſe, and is conſequently loſt in the dairy. The ſcalding above deſcribed is by no means ſufficient to remove this deſtructive taint; and as the diſhes are totally uſeleſs till that be removed, the following more efficacious proceſs muſt be adopted:——

Fill the veſſel with water ſcalding hot, and into that put a conſiderable quantity of hot aſhes, and ſmall red embers from the fire. Stir it about frequently, ſcrubbing it well in every part with the ſcrubber. Let this remain a conſiderable time; then empty the diſh, ſcrub it as uſual with ſcalding hot water, rinſing it well with hot, and then with cold water. Then fill it to the brim with cold water, better if that water can be made to run into it in a continued ſtream, and flow over the brim; let it ſtand in this ſtate ten or twelve hours or more, after which wipe and dry it, and if the taint has not been very ſtrong, it will then be fit for uſe.

If the aſhes of your fire ſhould chance to contain very little ſalt, this operation may perhaps not prove effectual. In that caſe add a ſmall proportion of potaſhes along with the embers, &c. or quick-lime may be employed along with the potaſhes, which greatly adds to their cleanſing power. But in all caſes where recourſe is had to this proceſs, take great care that the diſhes be well cleaned by the rubber at each time; and that cold water be allowed to ſtand a conſiderable time in them, general it muſt be ſalted before it can be carried to market. And as this part of the proceſs requires as great nicety as any other, a few remarks on the ſubject ſhall be added.

Wooden veſſels are, upon the whole, moſt proper to be employed for containing ſalted butter. Theſe ſhould be made of cooper work, very firm, and tightly joined with ſtrong *wooden* hoops. It will be adviſeable to make them very ſtrong where circumſtances permit them to be returned to the dairy; for as it is a matter of conſiderable difficulty to ſeaſon new veſſels ſo well as that they ſhall not affect the taſte of the butter, it is always adviſeable to employ the old veſſels rather than make new ones, as long as they continue firm and ſound. Oak is the beſt wood for the bottom, and ſtaves and broad Dutch ſplit hoops are to be preferred to all others, where they can be had. Iron hoops ſhould be rejected, as the ruſt from them will in time ſink through the wood, though it be very thick, and

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them, which ſhould be frequently changed, that the whole of the ſalts may be extracted by it before they be uſed again.

The diſhes for holding the cream, and the ch[illegible], require to be ſcalded, ſcrubbed, rinſed, and dried, after each time they are uſed, in the ſame manner as the milk diſhes; but, as a ſour taint is not here ſo prejudicial, it is not neceſſary to guard ſo carefully againſt it as in the milk diſhes. But if ever this taint ſhould become too ſtrong, it may be diminiſhed by the proceſs above deſcribed.

injure the colour of the butter: one iron hoop, however, ſhould be put at the top, and another below beyond the bottom, the projection below the bottom being made deep for this purpoſe. No form is more convenient than that of a barrel, unleſs, perhaps, it be that of a truncated cone, with the apex uppermoſt; as in this caſe the butter never can riſe from the bottom, and float upon the brine, which it will ſometimes do in the under part of a barrel when brine is neceſſary. But this inconvenience may be eaſily obviated, by driving a wooden peg with any kind of a head into the bottom before it be filled, as the butter cloſely embracing that head all round, will be kept perfectly firm in its place.

An old veſſel may be prepared for again receiving butter, by the ordinary proceſs of ſcalding, rinſing, and drying; but to ſeaſon a new veſſel requires greater care. This is to be done by filling it frequently with ſcalding water, allowing it to remain till it ſlowly cools. If hay, or other ſweet vegetables, are put into it along with the water, it is ſometimes thought to facilitate the proceſs. But in all caſes, frequent affuſions of hot water are very neceſſary, and a conſiderable time is required before they can be rendered fit for uſe. The careful *dai* ought to be particularly guarded with reſpect to this particular, or he may ſoon loſe his character at market.

After the butter has been beaten up and cleared from the milk, as before directed, it is ready for being ſalted. Let the veſſel into which it is to be put, after being rendered as clean and ſweet as poſſible, be rubbed all over in the inſide with common ſalt, and let a little melted butter be run into the cavity between the bottom and the ſides at their joining all round, ſo as to fill it and make it every where fluſh with the bottom and ſides. It is then fit to receive the butter.

Common ſalt is almoſt the only ſubſtance that has been hitherto employed for the purpoſe of preſerving butter; but I have found, by experience, that the following compoſition is, in many reſpects, preferable to it, as it not only preſerves the butter more effectually from any taint of rancidity, but makes it alſo look better, and taſte ſweeter, richer, and more marrowy, than if the ſame butter had been cured with common ſalt alone. I have frequently made comparative trials with the ſame butter, and always found the difference much greater than could be well conceived. The compoſition is as follows:

Take of ſugar one part, of nitre one part, and of the beſt Spaniſh great ſalt, (or of Doctor Swediaur's beſt ſalt,* which is ſtill better than the former, being cleaner) two parts. Beat the whole into a fine powder, mix them well together, and put them by for uſe.

Of this compoſition one ounce ſhould be put to every ſixteen ounces of butter;† mix this ſalt thoroughly

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* Dr. Swediaur carries on a manufacture of ſalt at Preſtonpans near Edinburgh, after the Dutch method; this the Dutch ſell by the name of ſalt upon ſalt; it is equally ſtrong with the beſt Spaniſh ſalt, and much freer from impurities of every ſort, and the Doctor ſells it at a moderate price. Were this ſalt ſufficiently known to be brought into general uſe for curing fiſh, butter, beef, pork, bacon, hams, tongues, and other articles of proviſion, it would much promote the proſperity of this country, as theſe could be as well cured by it as with foreign ſalt, and at a much ſmaller expence.

† It is of great conſequence that every proceſs, which requires much thought or nicety, ſhould be baniſhed, if poſſible, from all branches of manufacture. On this principle, as ſome difficulty might ariſe in proportioning the quantity of ſalt to unequal weights of butter, I ſhould adviſe that every perſon who means to adopt this practice at large ſhould begin with providing himſelf with a ſteelyard ſo conſtructed as that ſixteen ounces in the one ſcale is exactly balanced by one in the other. And that he may be at no loſs to provide himſelf with this ſimple apparatus, the following directions may be attended to:

Let him provide two ſcales of equal weight; one of them ſhould be of wood, and flat for the butter, no matter what form or materials the other is of; let him then take a ſlip of deal two inches broad, half thoroughly with the butter as ſoon as it has been freed from the milk, and put it without loſs of time down into the veſſel prepared to receive it, preſſing it ſo cloſe as to leave no air-holes, or any kind of cavities within it. Smooth the ſurface, and if you expect that it will be above a day or two before you can add more, cover it cloſe up with a piece of clean linen, and above that a piece of wetted parchment, or for want of that, fine linen that has been

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an inch thick, and two feet long. Near to each end, and at about half an inch from the ſame ſide at each end, make a hole through the board, to which the ſcales may be faſtened by means of a loop of wire; obſerve, that theſe two holes ſhould be placed exactly at the ſame diſtance from the edge. Let him then load the two ſcales, one of them with one ounce, and the other with ſixteen, and having drawn a line parallel to what will now appear to be the upper ſide of the beam, at half an inch from the top all along on each ſide, let him be provided with two ſharp-pointed inſtruments, ſuch as a ſhoemaker's awl: Let him then try to find a point in the new-made line on each ſide of the beam, where, when the beam is allowed to vibrate on his awls placed directly oppoſite to each other, the two weights balance each other. This point he will ſoon diſcover to be much nearer one of the ends of the beam than the other. Through this point let him pierce a hole by means of a round hot iron. Through this hole put a piece of thick iron wire, which if ſupported at each end will ſerve as a pevot. The apparatus is now compleat.

And whenever it is afterwards wanted, nothing more is neceſſary than to place the butter, whatever be its weight, into the butter-ſcale, and then put as much of the compoſition into the oppoſite ſcale as brings the beam to a balance: and this will in all caſes be the due proportion of ſalt for the butter, whatever the weight of that butter may be.

dipped in melted butter, that is exactly fitted to the edges of the veſſel all round, ſo as to exclude the air as much as poſſible, without the aſſiſtance of any watery brine; when more butter is to be added, theſe coverings are to be taken off, and the butter applied cloſe above the former, preſſing it down and ſmoothing it as before, and ſo on till the veſſel be full. When it is quite full, let the two covers be ſpread over it with the greateſt care, and let a little melted butter be poured all round the edges, ſo as to fill up every cranny, and effectually exclude the air. A little ſalt may be then ſtrewed over the whole, and the cover be firmly fixed down to remain cloſe ſhut till it be opened for uſe. If all this be carefully done, the butter may be kept perfectly ſound in this climate for many years. How many years I cannot tell; but I have ſeen it two years old, and in every reſpect as ſweet and ſound as when it was only a month old.

It deſerves to be remarked, that butter cured in this manner does not taſte well till it has ſtood at leaſt a fortnight after being ſalted; but after that period is elapſed, it eats with a rich marrowy taſte, that no other butter ever acquires; and it taſtes ſo little ſalt, that a perſon who had been accuſtomed to eat butter cured with common ſalt only, would not imagine it had got one fourth part of the ſalt that would be neceſſary to preſerve it.*

Butter thus cured would bear to be carried to the Eaſt or the Weſt-Indies, and would keep ſweet during the longeſt voyages, if it were ſo packed as not to allow the butter to be ſo far melted as to occaſion the ſalts to ſeparate from it. But as none of theſe ſalts admit of any chemical union with the butter, it muſt happen, that if ever the butter be ſo far melted as to become of a fluid conſiſtence, the ſalts drop to the bottom, and the butter, deprived of their antiſeptical powers, quickly becomes rancid. It would be a great improvement in the culinary art, if any antiſeptick ſubſtance could be found that poſſeſſed any agreeable taſte and flavour, which was capable of being diſſolved in oily ſubſtances. This might afford a proper ſubject for a premium by the Bath Society. In the mean time the following hints on this ſubject may be of ſome uſe.

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* But after this butter has been cured in the moſt perfect manner, it may chance to be much debaſed in its quality by being improperly treated during the time it is uſing. Therefore, obſerve, that, when it is broken up for uſe, a ſmall portion ſhould be pared from the ſurface all over, eſpecially near the edges, in caſe the air ſhould not have been ſo entirely excluded as it ought to have been. If it be to be quickly conſumed, it may be then ſpooned up as it is wanted, without any other precaution than that of keeping it carefully covered up ſo as to exclude duſt, &c. from having acceſs to it. But if it be to be uſed very ſlowly, and if the perſon to be employed in ſpooning it up be not very careful, or ſo indolent as not to be at the trouble of cloſing it up at each time with the covers, it may happen that the part which is thus long expoſed to the air may contract a ſmall degree of rancidity. To guard againſt this evil, in theſe circumſtances, when the veſſel is opened, let a ſtrong brine of common ſalt be prepared that will ſwim an egg, and poured, when cold, upon the ſurface of the butter; this will cover that ſurface effectually, even though the operator ſhould be a little careleſs, and will thus guard againſt the inconvenience complained of: for though the quality of the butter will thus be injured in ſome degree, in conſequence of the water acting upon it, yet that is an evil of far leſs material moment than the ſlighteſt degree of rancidity would occaſion.

Butter, in its natural ſtate, contains a conſiderable proportion of mucous matter, which is more highly putreſcible than the pure oily parts of the butter. Where it is, therefore, intended that butter ſhould be expoſed to the heat of warm climates, it ought to be freed from that mucilage before it be cured and packed for keeping. To prepare butter for a diſtant voyage, therefore, in warm climates, let it be put into a veſſel of a proper ſhape, which ſhould be immerſed into another containing water. Let the water be gradually heated till the butter be thoroughly melted; let it continue in that ſtate for ſome time, and allow it to ſettle; the mucous part will fall entirely to the bottom, and the pure oil will ſwim at top, perfectly tranſparent while hot, but when it cools it becomes opaque, aſſumes a colour ſomewhat paler than the original butter before it was melted, and a firmer conſiſtence, more nearly reſembling that of tallow, and conſequently it will better reſiſt the heat of a warm climate than butter itſelf. When this refined butter is become a little ſtiff, and while it ſtill is ſomewhat ſoft, the pure part ſhould be ſeparated from the dregs, and then ſalted, and packed up in the ſame way as is directed for butter. This would retain the ſalt longer, and keep much longer ſweet in hot climates, than if it had been cured in its original ſtate.

This refined butter may be preſerved in yet another way, which I have ſometimes ſeen practiſed here by way of medical *bonne bouche* (comfit.) After the butter is purified, add to it a certain proportion of firm honey, mix it well, it will incorporate thoroughly with the butter, and when cold it eats very pleaſantly ſpread on bread like butter; and may be given to old people, if they reliſh it, inſtead of marrow, and to others, as being uſeful for coughs and colds. Theſe were the uſes to which I have ſeen this ſubſtance applied, and on theſe occaſions the proportion of honey employed was conſiderable. I have ſeen it kept for years, without manifeſting the ſmalleſt tendency to rancidity, ſo that there can be no doubt but that butter might thus be preſerved in long voyages without ſpoiling. The only point that remains to be aſcertained is, what is the ſmalleſt proportion of honey that would be ſufficient to preſerve the butter. Sugar is known to be a much more powerful antiſeptic than common ſalt, and probably honey may be in that reſpect nearly on a par with ſugar. If ſo, it would be reaſonable to ſuppoſe that one ounce of honey might be ſufficient to preſerve ſixteen ounces of butter. In that caſe the taſte of the honey would not be extremely perceptible, ſo that the butter, even to thoſe who might not reliſh the ſweet compoſition above-mentioned, might prove very agreeable, eſpecially if a little ſalt were mixed with it when about to be uſed. A few experiments would be ſufficient to aſcertain this particular.

From the circumſtance of the honey incorporating with the butter, and not ſeparating from it while in a fluid ſtate, it would promiſe nearly to accompliſh the purpoſe wanted above. Whether, when it became very fluid, and was long continued in that ſtate, any ſeparation would take place; or whether the honey in theſe circumſtances would be in danger of fermenting; are queſtions that experience alone can determine. Sugar, though it would preſerve the butter equally well while it continued in a ſolid ſtate, would doubtleſs ſeparate from it when it became fluid. Whether melaſſes would do ſo, or what effects they would in this caſe produce, I cannot tell; but a few experiments would aſcertain theſe points. Should any method of preſerving butter in warm climates be diſcovered, it would be productive of ſo many benefits to individuals, and to the nation at large, by giving an opening for a new branch of commerce and manufacture, that it is much to be wiſhed the few experiments wanted to aſcertain theſe points were made with ſuch care, under the direction of perſons who would faithfully report the reſult to the public, as ſhould be ſufficient to remove all doubts upon this head.

P. S. The greateſt part of the obſervations contained in the foregoing pages were derived from a Lady, who is now beyond the reach of being affected by any thing in this ſublunary world. Her beneficence of diſpoſition induced her never to overlook any fact or circumſtance that fell within the ſphere of her obſervation, which promiſed to be in any reſpect beneficial to her fellow-creatures. To her gentle influence the publick are indebted, if they be indeed indebted at all, for whatever uſeful hints may at any time have dropt from my pen. A being, ſhe thought, who muſt depend ſo much as man does, on the aſſiſtance of others, owes as a debt to his fellow-creatures the communication of the little uſeful knowledge that chance may have thrown in his way. Such has been my conſtant aim: ſuch were the views of the wife of my boſom—the friend of my heart, who ſupported and aſſiſted me in all my purſuits. I now feel a melancholy ſatisfaction in contemplating thoſe objects ſhe once delighted to elucidate.

Article V.

Of the Scotch Fir, as a Food for Cattle.

[By the Same.]

IT is not in general known that any of our evergreen ſhrubs or trees, except the *whins*, [furze] can be employed as a provender for cattle; but probably many more of theſe could be ſucceſsfully employed for that purpoſe than is in general ſuſpected.

Cattle and ſheep are known to crop the tops of fir-trees when they can get acceſs to them while young; and thus many plantations of young trees, when not ſufficiently fenced, have been entirely deſtroyed; but whether that kind of food was wholeſome or pernicious to the cattle, has not in general been enquired into.

We have indeed heard long ago, that in Norway the cattle are often fed in winter upon the tender twigs of young fir-trees; but as we are at the ſame time told that for want of other food they are ſometimes forced to ſubſiſt upon dried fiſh-bones beat ſmall, this had the appearance of being the conſequence of extreme neceſſity alone. It has been found, however, on ſome trials that have been made in the North of Scotland, that the tender twigs of the Scotch fir afford a wholeſome food for cattle, that may be occaſionally employed for that purpoſe without danger, in caſe of a ſcarcity of other provender.

The firſt notice I had of this particular was in a letter from the father of a gentleman of conſiderable eminence in ——ſhire, dated the 25th of October, 1782, which runs thus:. "I was ſo pinched laſt "ſpring for provender to cattle, that I had not a "ſtone of ſtraw, or a ſtone of hay, from the middle "of March; nothing but whins and oats for horſes, "and fir-tops (that is, tender ſhoots of firs) for "cattle; and I had 430 horned cattle, and about "120 horſes ſmall and great, of which I loſt but "few (four or five, I cannot tell which) cattle, but "there were numbers of cattle that died in this "country for want. Some tenants loſt the one-"half of their cattle, and ſome almoſt the whole."

It deſerves to be noted, that the ſpring of 1782 was ſo backward, that in the country here alluded to, it was near the middle of June before the graſs was ſufficiently up to ſupport the cattle, ſo that they had been kept near three months entirely upon this kind of food,—a ſufficient trial of its wholeſomeneſs. It deſerves further to be remarked, that in Highland countries, where great numbers of young cattle are reared, there never is a winter that ſome of them do not die, however plentiful the provender is. In the preſent caſe, it is probable, the death of the few that were loſt might be occaſioned by the weakneſs of the young beaſts, produced by pinching them of food before the provender was done, rather than to the influence of the new food they were put upon.

I was afterwards told, upon enquiry, that in this caſe the cattle were kept in the houſe, and the twigs of the trees carried to them and given them in their ſtalls; but I afterwards learnt that the ſame ſeaſon, another gentleman, who knew nothing of this experiment, adopted a method that ſeemed to me to be more ſimple and œconomical, and eaſier carried into practice on a larger ſcale than the above.

Having foreſeen that he ſhould be ſcarce of provender, he turned out all his ſtock of two years old cattle into a young fir wood that was near his houſe, in the beginning of winter, and allowed them to pick up what little graſs they could there find, till he ſaw it was all conſumed. He then ſent a man into the wood every morning to cut down from the trees as many branches as would ſubſiſt them for that day. Theſe were allowed to fall among the trees at random. The cattle ſoon became accuſtomed to this food, and ran to the place where the man was, as ſoon as they heard the noiſe. They ate not only the leaves and ſmalleſt twigs, but they even ſometimes gnawed down the ſtumps till they came to be nearly the bigneſs of the thumb. In this way they continued all winter, in perfect health.

From theſe facts, and others of a ſimilar kind that have ſince then come to my knowledge, there can be no doubt but that the twigs of firs may, in times of ſcarcity of fodder, be employed with ſucceſs in preſerving cattle from the danger of periſhing from want. It is not, at preſent, by any perſon ſuſpected that this feeding would fatten any of them; it is only recommended as being ſufficient to preſerve them alive, and in good health, when other food fails. To perſons who live in a corn country, where provender is always plenty, and the ſtock of cattle ſmall, this will appear a matter of trivial importance: but in hilly breeding countries, where grain is ſcarce, and the ſtock of cattle very great, it will be viewed as of the higheſt importance, as will appear from the letter above quoted. There is no country, eſpecially of the barren ſort, in which a plantation of fir-trees may not be eaſily reared; and in this caſe it would always be a ready ſource of plenty, to which recourſe need not be had until a general ſcarcity ſhould make it nececeſſary.

It is alſo well known that ſheep eat this food very greedily, and that it never hurts them; and as theſe valuable little animals are frequently prevented from reaching the graſs by reaſon of ſnow, and the ſtock of hay provided for them ſometimes fails ſo entirely as to occaſion the total loſs of many thouſands at once, in extenſive ſheep countries, which might be altogether prevented by having a ſmall plantation of firs on each farm, to be kept as a reſerve of acceſſible food, to be uſed only when other reſources failed; I cannot think any ſenſible man, in theſe circumſtances, ſhould delay one moment to ſet about forming this neceſſary incloſure upon every farm. I ſtate facts; and leave thoſe who have occaſion for it to make the proper uſe of them.

ARTICLE VII.

Of raiſing Potatoes from the Seed.

[By the Same.]

SINCE the paper on potatoes, which is printed in your former volume, was written, I have made ſeveral other experiments on the culture of that plant; but I only mean at preſent to correct one erroneous opinion I had adopted from the reſult of the *ſingle* experiment I had then made with regard to the raiſing potatoes from ſeed. I at that time thought it probable that no new varieties could be thus obtained, and doubted whether a mongrel breed could thus be produced, like that which may be obtained at pleaſure from different varieties of turnips, cabbages, &c. I am now, however, convinced, from an experiment that was conducted with greater care, that there are plants which do produce varieties from ſeeds, greatly different from the parent ſtock; that theſe varieties are not of the nature of mongrels, but are altogether diſtinct from any ſorts that may have been known; and that the potatoe belongs to this claſs of plants.

With a view to aſcertain theſe particulars, I made choice of a kind of potatoe that I had got from

Ireland, which was, in many of its moſt obvious characteriſticks, extremely different from any that was cultivated in this neighbourhood. In particular its colour was remarkable, being a dark dirty purple; its ſhape a round irregular bulb; its ſtem tall and upright. This kind of potatoe was planted by itſelf, at as great a diſtance as I could place it from any other ſort; but all the varieties that were around it were of the white ſort, none of any other colour being cultivated in this neighbourhood.

The ſeeds of this ſort, carefully ſeparated from all others, were ſown by themſelves, and the ſeedlings planted out at a convenient diſtance from each other, when they had attained a proper ſize for being tranſplanted. It was ſoon, however, obvious, from the appearance of the ſtems, that they were not all of one ſort; and on taking them up in autumn, I then diſcovered that the variety was almoſt infinite, and ſuch as could not be accounted for on the principles of a mongrel adulteration. The diverſities reſpected colour, ſhape, &c. a few of which particulars are ſpecified below.

COLOUR. Dark purple, bright red pink, dark pink, other varieties of red, bright white, dun, yellow, black, dark greeniſh, ſpotted, and many other varieties.

Shape. Round bumps, oblong, very long, kidney-ſhaped, irregularly knobbed, and many other ſorts.

Time of Ripening. Very early, ſo as to have the ſtalks quite decayed in Auguſt; very late, ſo as to have the bulbs only beginning to be formed in the middle of October, and an infinite diverſity between them.

Stems. Tall and robuſt, weak and dwarfiſh, branching at the top, branching greatly from the root, quite upright, and naked as a ſtaff, &c. &c.

Manner of Growth. The bulbs adhering quite cloſe to the ſtem in a cluſter like a bunch of grapes; others rambling to a great diſtance from the ſtem, adhering to long fibres running wide in every direction, and intermediate diverſities of many ſorts.

Size of Bulbs. Some large as a hen's egg, others very ſmall, not much bigger than peaſe, and intermediate varieties.

Prolificacy. Some producing an immenſe number, as high as 140 at one ſtem, others affording few, as low as two or three only.

Skin. Some ſmooth as ſilk, others rough like ſhagreen; ſome whole and uniform, others cracked in a variety of directions.

Leaf. Some broad and obtuſe, others narrow, ſharp and ſpur-ſhaped; ſome ſmooth, others rough; ſome comparatively gloſſy and ſhining, others uneven and much wrinkled, &c.

It would be endleſs to trace out all the other diverſities. In ſhort, the variety was greater than I could have conceived to be poſſible; and there was not perhaps two plants preciſely of the ſame ſort.

It is probable there will be found to be as great a diverſity in the taſte and other qualities, as in thoſe particulars already remarked; but this I could not ſo readily aſcertain.

From the above enumerations, it appears to me inconteſtibly evident, that the varieties can be in no ſort aſcribed to the influence of different varieties producing a compound between them, as in the mongrel breeds. There were many red, bright red, kinds of potatoes, though there was not one of that colour grew in the neighbourhood; and no mixture of white and dark purple could ever produce a bright red, or a dark bottle-green; not to mention the diverſities in other reſpects: therefore it cannot, I think, be denied that this experiment affords a clear demonſtration, that there are plants which do not produce others of the ſame ſort with themſelves when reared from ſeeds, but varieties of the ſame claſs of plants, which may be diverſified without end, the nature of which diverſities cannot be foreknown.

Allow me, therefore, to add one more to the two claſſes of plants that were diſtinguiſhed in my former paper; and we ſhall now have the following three claſſes of plants, viz.

1ſt. *Invariable*, viz. Thoſe that always produce the ſame kind in every reſpect, with that of the ſeed ſown; ſuch as peaſe, beans, &c.

2d. *Permanent*. By which I mean thoſe plants that may be propagated from ſeeds without change, as long as they are reared at a great diſtance from other varieties of the ſame plant, but which will be altered if ſuffered to grow near others of the ſame ſort, producing with certainty an intermediate *mongrel* kind, participating of the nature of the ſorts that grew near to each other, and nothing elſe; viz. Cabbages, turnips, beets, &c.

3d. *Sporting*,

3d. *Sporting*, or thoſe which always produce varieties from ſeeds without any known or apparent cauſe; as the potatoe, and many other plants.

There are probably other claſſes of plants that have not yet been obſerved or thought of.

It was to be obſerved, however, that though the variety of ſorts was very great, yet the parent breed ſeems to have *ſome* influence on the progeny; as there were a greater number that in ſome ſort reſembled the parent ſtock than could be found of any other individual ſort.

I ſhall not take up the time of the Society, by making many remarks on this experiment. It is enough that the fact be aſcertained. Varieties may be obviouſly obtained from ſeeds; and ſome of theſe varieties may be found that ſhall poſſeſs valuable qualities that have not yet been found united in any ſingle ſort, though it is probable that for one truly valuable ſort, many may be found which will not be nearly ſo well worth cultivating as thoſe we already poſſeſs. Theſe conſiderations, while it ought to induce thoſe who have good opportunities for doing it, thus to raiſe new varieties each year, ſhould alſo induce them to be particularly attentive to aſcertain the qualities of each ſort reſpectively, with the moſt rigorous and cautious attention, ſo as not to allow themſelves to be impoſed on either by prejudice or prepoſſeſſions of any ſort; for it is thus alone that uſeful ſorts can be really obtained.

By attending to the facts above ſtated, it will alſo appear, that, in order to make a proper diſcrimination, the produce of each individual ſeedling plant ought to be cultivated entirely by itſelf, till its qualities be fully aſcertained; and that none of the others be mixed with it, however much they may reſemble it in appearance; as the qualities of theſe may be very different.

It would ſeem to me probable, that gentlemen, who have hitherto been in the practice of rearing ſeedling potatoes, have not been ſo ſtrictly attentive to this laſt rule as ſeems to be neceſſary, and it is probably owing to this circumſtance that we ſometimes meet with particular ſtems of potatoes in a field, which, although reſembling others in appearance, are extremely different from them in reſpect of prolificacy, and ſome other leſs obvious, though as important qualities. From this circumſtance too, may have ariſen many variations in the reſult of particular experiments on the culture of this plant, which ſeem to be altogether irreconcileable to each other.

Since thoſe who conduct experiments of this ſort, are thus ſo liable to be miſled by unobſerved particulars, ſo as to mark concluſions ſo different to each other; how cautious ſhould they be not raſhly to impeach the veracity of each other! *Should two men, for example, take live potatoes* from the ſame heap, ſeemingly alike in every reſpect, we ſee that their experiments, though conducted with equal care and accuracy, might give very different reſults.

ARTICLE IX.

Of Furze or Whins, [Ulex Uropæus, Linn.] *as a Food for Horſes and Cattle. Deſcription of a Machine for bruiſing them, and Hints for rearing that Plant œconomically as a Crop.*

[By the Same.]

I SHALL ſend for the Society a model of a machine for bruiſing *furze*, or as we uſually call that plant in this country, *whins*, to render them a proper food for horſes and cattle. This is an exact model of a machine I have employed for many years paſt, and have found to anſwer the purpoſe perfectly well. By the help of this machine, if the whins are good, one man, with an old horſe not worth more than twenty or th[illegible]y ſhillings, may bruiſe as many whins as would keep forty head of beaſts conſtantly eating that were fed on nothing elſe. This is independent of cutting and bringing home the whins, which in many caſes will coſt more upon the whole than the bruiſing.

The machine is ſo ſimple in all its parts, as to be readily underſtood by inſpection only. It conſiſts of a large circular ſtone ſet on its edge (the weightier and bigger the better) with a wooden axis paſſing through its centre. One end of this axis is fixed upon a pivot placed in the centre of a circular area, and to the other end of it is fixed a yoke, to which the horſe that is to move it is attached. The ſtone being placed on its edge, when the horſe moves, it revolves round its axis in a circular groove, or ſtone trough, (this trough ſhould be made of hewn ſtone) exactly in the ſame manner as a ſugar-baker's or a tanner's mill. The whins being placed in this trough are bruiſed by the weight of the ſtone as it paſſes over them, and being raiſed up by a three-pronged fork by the attendant, after they have been well flatted down, they riſe in a ſort of matted cake, which, being ſet in ſome meaſure upon its edge, is again ſmaſhed down by the wheel as it revolves around. In this way the operation is continued, by ſucceſſively preſenting new ſurfaces to the action of the wheel, till the whole is reduced to a ſoft pulpy maſs, that can eaſily be eaten by the animals to which it is to be preſented.

During the continuance of this proceſs, it is neceſſary to pour plenty of water upon the whins, at different times, without the help of which, they can ſcarcely be reduced to a pulp ſoft enough. On this account it will be proper to make choice of a place for the machine, where plenty of water can be obtained with little labour. It follows alſo, that as rain can never be prejudicial to this operation, it may properly be placed in the open air.

As this operation is greatly facilitated by a judicious way of raiſing or turning the whins, during the operation, which a little experience will enable any attentive perſon to attain, but which cannot be taught by words only; I would therefore adviſe any perſon who ſhould think of erecting an apparatus of this ſort, to put one of his moſt ſagacious ſervants to conduct this operation at the beginning, as ſuch a perſon will more quickly diſcover the circumſtances that facilitate the proceſs, than one of a ſlower comprehenſion would do. After he has become expert at the buſineſs, he will be able to inſtruct an inferior perſon, who may then be employed for the purpoſe. But in whatever way it ſhall be conducted, the perſon who begins this manufacture muſt lay his account with performing very little work for ſome time at the firſt, in compariſon of what he will be able to execute afterwards with eaſe.

If the whins that are to be employed for this purpoſe grow naturally in the ſoil in irregular buſhes, it is a troubleſome work to cut and gather them. To underſtand the proper mode of managing this buſineſs in all its departments, it is neceſſary to advert to ſeveral particulars in the natural œconomy of this ſingular plant. Inſtead of leaves, the whin is furniſhed with an innumerable quantity of prickles. Theſe ſpring out from every part of the young ſtem, and are, at the firſt, like the ſtem itſelf to which they adhere, ſucculent, ſoft, and inoffenſive; but like the ſtems alſo, they become gradually harder, as the ſeaſon advances, and ſeem, indeed, to a caſual obſerver, to form a part of that ſtem, though they are as different from it as the leaves of other trees are from the branches which produce them.

Theſe prickles do not, like the leaves of moſt deciduous trees, fall off at the approach of winter, but like evergreens, they remain upon the branches all winter, and retain during that time their full ſucculence and verdure. Early in the ſpring, innumerable bloſſoms ſpring out around theſe prickles adhering to them, and not to the ſtem. The bloſſoms are ſucceeded by pods containing the ſeeds, which gradually ripen; a little after Midſummer the ſeeds harden, and the pods ſlowly become dry and wither, the prickles to which they adhere becoming dry and withered at the ſame time, and gradually looſen from the ſtalk, which ſtill continues freſh, though it has now attained a woody conſiſtence. Theſe prickles having now performed all the functions that nature had deſigned them, fall off in part, at firſt from the ſtalk, and in part adhere to it for ſome time, till they are gradually ſhaken off by the agitation of the wind, or other cauſes. Hence it happens that it is only the *ſurface* or top twigs of a whin buſh that are green, ſoft, and ſucculent, the ſtems below being dry and woody, and frequently covered with dry prickles, that are not only not uſeful as food for cattle, but rather hurtful to them, on account of the hardneſs of their conſiſtence, and ſharpneſs of their prickles.

In gathering whins, therefore, for food for cattle, it is only the tender top ſhoots that are wanted, and the eaſieſt method of gathering them that our practice has yet diſcovered, is to take a forked ſtick in the left hand (the readieſt thing is the branch of a thee of a proper ſize) and a ſickle in the right hand, (both hands, but more eſpecially the right, ſhould be armed with ſtrong gloves) then thruſting the ſickle among the young ſhoots, and pulling it backward, the forked ſtick when oppoſed to them k[illegible] the branches ſteady enough to [illegible]duce a reſiſtance ſufficient to make the ſickle cut them; and as the tops of the whins are intermixed with each other, they ſtick to the prongs of the fork, which, after it is as full as it can hold, is taken to a ſide, and cleared by preſſing the whins to the ground and pulling the fork backwards. These little heaps are afterwards forked to a cart, and preſſed down by a man walking upon them, having his legs covered with large ſtrong boots made on p[illegible], and thus are carried home.

If the whins [illegible] grown upon a good ſoil, and have made very vigorous ſhoots, they may be thus reaped pretty expeditiouſly; but if the ſoil has been poor, and the ſhoots ſhort, the expence of this operation is very conſiderable; and as theſe ſhort whins are, in other reſpects, of a very inferior quality to the others as food for beaſts, it is only at times when fodder is ſcarce and dear, that they [illegible] œconomically applied to this uſe.

To abridge this labour, and to obtain the full benefit of this valuable winter food, I tried myſelf to cultivate whins artificially, and have ſeen others rear them in ſeveral different ways, among which I found the two following modes of culture to prove the moſt ſucceſsful:

In a field of a good dry loamy ſoil I ſowed, along with a crop of barley, the ſeeds of the whin in the ſame way as clover is uſually ſown, allowing at the rate of from 15 to 30 pounds of ſeed to the acre. The ſeeds, if harrowed in and rolled with the barley, quickly ſpring up and advance under the ſhelter of the barley during the ſummer, and keep alive during the winter. Next ſeaſon, if the field has not a great tendency to run to graſs ſo as to choak them, they advance rapidly after Midſummer, ſo as to produce a pretty full crop before winter. This you may begin to cut *with the ſcythe* immediately after your clover fails, and continue to cut it as it is wanted during the whole of the winter; but it is ſuppoſed that after the month of February the taſte of this plant alters, as it is in general believed, that after that time horſes and cattle are no longer fond of it. I muſt however obſerve, that never having had myſelf a ſufficiency of whins to ſerve longer than till towards the middle of February, or beginning of March, I cannot aſſert the above fact from my own experience. I have frequently ſeen horſes beating the whins with their hoofs ſo as to bruiſe the prickles, and then eat them, even in the months of April and May; and ſheep which have been uſed to this food certainly pick off the bloſſoms and young pods at that ſeaſon, and probably the prickles alſo; ſo that it is poſſible this opinion may only be a vulgar error.

Circumſtances, which I need not here ſpecify, have prevented me from aſcertaining what is the weight of the crop that may be thus attained; but I think I may ſafely venture to ſay, that it is at leaſt equal to that of a crop of green clover; and if it be conſidered that this affords a green ſucculent food during winter, on which cattle can be fatted as well as on cut graſs in ſummer, it will I think be admitted, that it muſt be accounted even a more valuable crop than clover. After being cut it ſprings up the following ſeaſon with greater vigour than before; and, in this ſituation, acquires a degree of health and ſucculence very different from what it is ever obſerved to poſſeſs in its natural ſtate.* The prickles too are ſo ſoft, and the ſtems ſo tender, that very little bruiſing is neceſſary; indeed horſes, who have been accuſtomed to this food, would eat it without any bruiſing at all: but cattle, whoſe mouths ſeem to be more tender, always require it to be well bruiſed.

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* I have ſeen ſhoots of one ſeaſon near four feet in length.

How long this crop might continue to be annually cut over, without wearing out, I cannot ſay; I believe a long while, in favourable circumſtances; but *I muſt now take notice of a peculiarity, that unleſs guarded againſt, will very ſoon extirpate it, as I myſelf* experienced.

The natural progreſs of this plant has been deſcribed above with tolerable accuracy, but one particular was omitted. During the beginning of the ſeaſon, nature ſeems to be ſolely employed about the great work of fructification only, and it is not till near Midſummer that the whin begins to puſh forth its wood-bearing branches, which advance with great luxuriance only during the latter part of the ſeaſon. Hence it happens, that if care be not taken to have the graſs that ſprings up on the field before the whin begins to ſend out its ſhoots eaten cloſe down, that graſs will acquire ſuch a luxuriance before the young branches of the whin begin to advance, as to overtop them, and choak them entirely. Whoever therefore has a field under this particular crop, muſt be careful to advert to this circumſtance, or, if the field be in good heart, he will infallibly loſe it. The field therefore ſhould be kept, as a paſture, bare as poſſible during the beginning of the ſeaſon, and the cattle ſhould only be taken from it when the ſhoots of the whin are diſcovered to begin to advance with vigour. Under this management I preſume it may be kept for many years, and yield full crops: but unleſs the mowers ſhall be particularly attentive, *at the beginning*, to cut it as low as poſſible, it will very ſoon become impoſſible to cut the field with a ſcythe, as the ſtumps will ſoon acquire ſo much ſtrength as to break the ſcythe when it happens to touch them.

This is the beſt way I know of rearing whins as a crop for a winter food for cattle or horſes. For ſheep, who take to this food very kindly when they have once been accuſtomed to it, leſs nicety is required; for if the ſeeds be ſimply ſown broad-caſt very thin (about a pound of ſeed per acre) upon the pooreſt ſoils, after they come up the ſheep of themſelves will crop the plants, and ſoon bring them into round cloſe buſhes, as this animal nibbles off the prickles one by one very quickly, ſo as not to be hurt by them. Sheep, however, who have not been uſed to this mode of browſing, do not know how to proceed, and often will not taſte them; but a few that have been uſed to this food, will ſoon teach all the reſt how to uſe it.

Another very œconomical way of rearing whins that I have ſeen practiſed at large by another, rather than experienced it myſelf, is as follows:

Let a farm be incloſed by means of a ditch all round, with a bank thrown up upon one ſide; and if ſtones can be had, let the face of that bank be lined with the ſtones from bottom to near the top; this lining to ſlope backward with an angle of about ſixty or ſeventy degrees from the horizon. Any kind of ſtones, even round bullets gathered from the land, will anſwer the purpoſe very well: upon the top of the bank ſow whin ſeeds pretty thick, and throw a few of them along the face of the bank. Young plants will quickly appear. Let them grow for two years, and then cut them down by means of a hedge-bill, ſtripping down by the face of the bank. This mode of cutting is very eaſy; and as the ſeeds ſoon inſinuate themſelves among the crannies of the ſtones, the whole face of the bank becomes a cloſe hedge, whoſe ſhoots ſpring up with great luxuriance. If another ditch be made on the other ſide of the bank, and if this be managed in the ſame way, and if the hedge be cut down only once every ſecond year, (and in this way it affords very good food for beaſts) and the inſide and the outſide be cut down alternately, the fence will always continue good, as the hedge at the top will at all times be compleat. This mode of rearing whins is both convenient and œconomical. But where ſtones cannot be obtained for making the facing, the bank very ſoon moulders down, and becomes unfit for a fence.

I know few plants that deſerve the attention of the farmer more than the whin. Horſes are peculiarly fond of it. Some perſons think they may be made to perform hard work upon it, without any feeding of grain; but I think it tends more to fatten a horſe than to fit him for hard labour, and that therefore ſome grain ſhould be given with it where the work is ſevere. Cattle eat it perfectly well when thoroughly bruiſed, and grow fat upon it as upon turnips; but unleſs it be very well bruiſed for them they will not eat it freely, and the farmer will be diſappointed in his expectations. Cows that are fed upon it yield nearly as much milk as while upon graſs, which is free from any bad taſte; and the beſt winter-made butter I ever ſaw was obtained from the milk of a cow that was fed upon whins.

[We take this opportunity of publickly expreſſing our obligations to Dr. *Anderſon* for the model mentioned in the preceding eſſay, and which appears to be better adapted for the purpoſe than the ſtamping implements commonly uſed in Wales, and other parts. We have, from a motive of great reſpect to the opinion of our intelligent and worthy correſpondent, inſerted the eſſay at length, being confident that his practice of feeding cattle, &c. with young furze, ſo bruiſed, has not been adopted and continued without judgment. But we muſt at the ſame time beg his permiſſion to expreſs our doubts, whether it can be advantageouſly introduced on ſo general a ſcale as he may apprehend. The ſoil, in which it ſhould ſeem from experiment that the beſt crops of mowing furze are procured, we conceive may more advantageouſly be employed for the raiſing of corn; than which, and the intervening crops of green food that may be procured, particularly cabbages, we preſume to think nothing can be of ſo ſubſtantial a value. Local ſituations and peculiarities may, however, furniſh occaſional exceptions to this general rule; and eſpecially where land is comparatively cheap, and the article of fuel very dear, it may be of conſiderable advantage for the publick to be fully apprized of the beſt method of raiſing a crop, capable of being applied, as occaſion may happen to render convenient, to either of two uſeful purpoſes—food or firing.

ARTICLE X.

Of the Root of Scarcity.

[By the Same.]

THE ſeeds I had from a common ſeed-ſhop, therefore it is *poſſible* they were not of the true ſort; but the plants were ſo much like thoſe of the true ſort that have been deſcribed by others, that I think it is extremely *probable* they were genuine.

It is plainly a variety of the beet. The roots were of various colours, white, yellow, and red;

the difference in the intenſity of each of theſe tints was very great. The root is thi[illegible] and fleſhy, more reſembling the beetrave, or red beet, than the common beet; the leaves large and ſucculent, alſo more reſembling thoſe of the green beet than the beetrave. The ribs of the leaves are always of the ſame tint with the root. The fleſh of the root is coloured the ſame as the ſkin. Its taſte a mawkiſh ſweet, that is reliſhed by very few of the perſons who eat of it.

I ſowed part of the ſeed on a light ſandy ſoil, and part on a rich light loam. The plants on the laſt proſpered much better than the other; it ſeemed to me that the ſand was too poor a ſoil to rear this plant to its full ſize, though carrots, turnips, cabbages, and potatoes, were all reared upon it at the ſame time in the higheſt perfection. The ſeeds were ſown about the beginning of April. This ſeemed to be too early, as many of the plants ran up to flower during the ſummer, which greatly diminiſhed the crop, as they had been properly thinned before they began to run. Part of them were ſown where they were to remain, and part of them were tranſplanted. Thoſe that were not tranſplanted proſpered the beſt.

During the ſummer the leaves were tolerably abundant, but nothing like ſo luxuriant as I had been made to expect. I cauſed ſome of the blades to be gathered, but this ſeemed rather to retard the growth of the root. Indeed the quantity that could be procured, did not ſeem to be, *at that ſeaſon of the year*, worth the trouble of gathering. A much greater quantity of uſeful blades I think could be obtained from an equal extent of ground in cabbages. I am alſo inclined to think, that on the ſame ſoil, with an equal care in the culture, as great a weight of carrots or parſnips may be obtained; and I think there can be little doubt but a greater weight of turnips may be got; and that this laſt could be reared on many ſoils to great perfection where the root of ſcarcity could hardly be made to grow at all. I did not obſerve the ſmalleſt mark of any puncture from inſects on its leaves, during the whole period of its growth. In this reſpect it ſeems to reſemble the mulberry. Has Miſs Rhodes tried if her ſilk-worms will eat it?*

It ſeems to be rather more hardy during the winter than moſt kinds of turnips, particularly its leaves, though they do not perfectly reſiſt our winters: I even obſerved, that ſeveral of my plants were killed by the froſt during this winter. Upon a careful examination of them, however, I think I can obſerve that all thoſe that have been killed, diſcovered ſome tendency to be about to ſhoot up into flower-ſtems towards the end of autumn.

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* This queſtion being ſent to the lady, ſhe very obligingly made the experiment, but without ſucceſs.

I was anxious to know whether it continued late in the ſeaſon before it began to run to ſeed in the ſpring, as I was in hopes that if it ſhould be ſo, it would have ſome chance of proving a valuable addition to our catalogue of uſeful plants; but here alſo I have been diſappointed. The ſeaſon has been backward, and our turnips are only now (March 23d) beginning to ſhew their flower-ſtems. The root of ſcarcity is alſo faſt advancing to the ſame ſtage of its growth, ſo that it will probably fail about the ſame time with the turnip crop.

The root is reliſhed very well by cattle, and *my* horſes eat it;* but I ſhould fear it was of a nature

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* I find ſome perſons who have offered this root to horſes, which refuſed to eat it, entertain doubts if horſes could ever be brought to eat it; but no one ought in a caſe of this kind to be deterred by a ſingle trial. It often happens that a particular animal, or indeed many individuals, will refuſe to eat a particular food they have not been accuſtomed to, which is well known to be both wholeſome and palatable to that claſs of animals in general. I have ſeen many cattle that were, with great difficulty, brought to eat turnips, and ſome that never would take to that feeding kindly, ſo as to fatten upon it. I have alſo been informed, upon authority I could not doubt, that ſome ſheep have actually died before they could be brought to taſte that root. By a little attention, however, cattle may in general be brought to reliſh

rather too ſucculent to be a very proper food for horſes. I have no doubt but that cattle would thrive upon it very well, though the quantity I had was too ſmall to enable me to ſpeak experimentally to that point.

On the whole, though it is perhaps *poſſible*, that in certain circumſtances this plant may be cultivated with profit; yet I ſhould ſuſpect, that if my ſeeds were of the genuine ſort, it will not be found to be in general of equal value to the farmer as ſeveral plants with which we have been long acquainted. Independant of every other conſideration, it appeared to me that the expence of taking up and cleaning this root, ſo as to make it fit to be given to the cattle, would be ſuch as for ever to prevent it from coming into general uſe; for the fibres that ſpring out from it are ſo numerous and ſtrong, as to entangle a great deal of earth among them, from which, if the earth has the ſmalleſt tendency to adheſiveneſs, it is a matter of great difficulty to diſengage it. During wet weather in winter I do not

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any ſucculent root of the nature of this in queſtion, and horſes alſo. My horſes that are employed in taking turnips from the field in general learn in time of themſelves to eat turnips, though horſes in general do not take to this food at firſt. I ſaw a letter laſt year from a gentleman who had been at pains to train his horſes to eat turnips, and he found it put them into good condition, and gave them a fine coat, He therefore thinks that young horſes might be reared upon this root with advantage.

ſee how it would be poſſible to get this root taken up and made fit food for cattle any thing like a bearable expence, eſpecially that which has been tranſplanted.

ARTICLE XI.

Hints tending to point out the moſt practicable Means of improving the quality of BRITISH WOOL.

> " Mr. D'AUBENTON, foreſeeing that in proceſs of time the " Spaniard might become wiſe enough to keep his fine wool at " home and manufacture it himſelf, took his precautions to " prevent the injury that this might occaſion to the French " woollen-drapers. He engaged government to import ſuc- " ceſſively a great number of rams and ewes from Rouſillon, " Flanders, ENGLAND, Morocco, Spain, and even Tibet; " and he aſſembled all theſe fathers and mothers of future flocks " in his fold near Montbard, kept them for a whole year in the " open air, night and day, and coupled them together by ex- " perimental and well-contrived marriages.—Thus he ameli- " orated conſiderably this branch of rural œconomy, and ſu- " perfine cloths were made of wool of French growth."
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> *Monthly Review, Dec.* 1787. *Mem. R. Acad. of Paris, Anno* 1784.

IT is in general admitted, that no ſpecies of manufactures can be with ſo much certainty relied on, as a ſource of wealth and national proſperity, as thoſe which are employed in working up the natural productions [illegible] the country where the manufacture is placed: hence it follows, that every wiſe ſtate ought to beſtow a particular attention to the improvement of ſuch of its natural productions as are capable of being employed in working up *manufactures of general utility, and for which an extenſive demand may, at all times, be expected to take place.*

It was probably on theſe principles our anceſtors beſtowed ſo much attention to improving the quality of Britiſh wool: and they ſo happily ſucceeded in this attempt as to rear wool in this iſland of a finer quality than could be found in any other European nation. This was the means of eſtabliſhing thoſe extenſive woollen fabricks that have long been deemed the peculiar ſtaple manufacture of this nation, which ſerved as a firm baſis for an extenſive foreign trade.

Unfortunately, however, an idea began at length to prevail, that that pre-eminence which had been obtained in conſequence of long-continued exertions of *induſtry*, was only a neceſſary conſequence of phyſical cauſes. The peculiar fineneſs of our native wool was attributed entirely to the peculiarity of our climate, and delicacy of our paſtures; and it was concluded, that ſo long as that climate ſhould remain unchanged, and theſe paſ[illegible]es continue undeteriorated, our wool, without farther care, would continue to poſſeſs its wonted ſuperiority. This idea was ſo warmly cheriſhed as to influence, at length, the legiſlature itſelf. Meaſures were adopted *that turned the attention of the farmer from the improvement of his wool. The conſequence has been* that, by ſlow degrees, and imperceptible changes, the quality of our wool has been greatly debaſed, and, from being the very *firſt* in Europe, it is now confeſſedly allowed to hold, at beſt, no more than the ſecond place; as all our manufacturers concur in admitting that not a yard of ſuperfine cloth can be made of any thing elſe than Spaniſh wool. It follows of courſe, that we muſt now depend upon a foreign country for the raw materials of the fineſt branch of our favourite ſtaple manufacture. Thus have we unneceſſarily ſubjected ourſelves to all the inconveniences that muſt ever reſult from a dependant ſituation.

On the other hand, France, which, ever ſince the beginning of the adminiſtration of Mr. Colbert, hath made the moſt vigorous efforts to rival us in this important branch of manufacture, being now on an *equal* footing at leaſt with ourſelves in reſpect to the trade in Spaniſh wool, has ſo far ſucceeded as entirely to ruin our once flouriſhing traffick in fine cloths to the Levant; and bids fair for rivalling us in that article in other markets. But not contented with that ſingle advantage, that politick nation, by having turned their attention for many years paſt towards the improving the quality of the wool of their own native produce, have at laſt, as appears by the authority referred to in the motto to this paper, under the auſpices of the indeſatigable Mr. D'Aubenton, been able to make ſuperfine cloth entirely of their own wool, which was equal in beauty to that made of the beſt Spaniſh wool, and which, upon trial, was found to be ſuperior to it in the wear.* Theſe are facts which cannot be controverted, and they clearly prove, that if our ſuperfine cloths are at preſent better than thoſe of France, this ſuperiority cannot be aſcribed to the greater fineneſs of our own wool: they likewiſe ſhew, that if, in conſequence of the abſurd prepoſſeſſion we have ſo long entertained concerning the magical qualities of Britiſh wool, we ſhall continue to neglect to attend to its improvement, while the French exert themſelves in improving theirs; the time may at length arrive, when, in conſequence of the gradual improvement in the quality of French wools, and the imperceptible decline of ours, the wool of

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* See Memoirs of the Royal Academy of Sciences, ann. 1784 & 1785.

France may come to be not only equal in quality to that of Britain, but may even become as much ſuperior to it, as Britiſh wool in former times exceeded that of France. To guard againſt this evil, I beg now to call the attention of my countrymen to this important object, and hope I ſhall be able to ſhew, in a very ſatisfactory manner, that if ever this revolution ſhall be permitted to take place, it muſt be owing to our own negligence alone; becauſe, although it may not be impoſſible to improve the quality of French wool, yet it would be ſo much more eaſy to improve the quality of Britiſh wool, that if equal pains ſhall be taken in both countries, we cannot fail to leave them at an infinite diſtance behind. I ſhall farther, I hope, be able to prove, that by a very moderate effort, we could not only ſucceed in bringing Britiſh wool to regain once more its former ſuperiority over that of Spain, but that it could be eaſily brought to a greater degree of fineneſs and excellence of quality than any wool that ever could be purchaſed for the purpoſe of manufactures in Europe: and that all this could be done, becauſe of certain peculiarities reſpecting the nature of this iſland, which no other rival nation can boaſt of.

That the ſoil and climate of this iſland are naturally adapted to the production of fine wool, will ſcarcely be diſputed; the well-known fact that it did once produce the fineſt wool in Europe being a ſufficient proof of this circumſtance; but that ſoil and climate alone are not ſufficient to overrule the influence of all other circumſtances, our own experience alſo too clearly proves. To be able to judge how far *nature* aſſiſts us in this enterprize, and in what reſpects it becomes neceſſary to call in the aſſiſtance of *art*, the two following facts ought to be very particularly adverted to.

1ſt. *Every filament of wool is greatly altered by the heat or the cold that the animal producing that wool is ſubjected to during the period of its growth; that part of the wool being always coarſeſt which is produced in warm weather, and fineſt in cold weather.*[*] Hence it neceſſarily follows, that as wool continues to grow at every ſeaſon of the year, that part of the filament which grows during the ſummer muſt be coarſer than what grows during the winter ſeaſon. If, therefore, the difference between the heat of ſummer and the cold of winter be very great in any place, it will be impoſſible there to rear good wool of a fine quality, becauſe, however fine that part of it may be, which grows in winter, that part of it which is produced in ſummer muſt be very coarſe.

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[*] For proofs of this fact, ſee Obſervations on the means of exciting a Spirit of National Induſtry, Letter VI.

And as it is impoſſible, by ſorting, in this caſe, to ſeparate the coarſe from the fine, the general ſtaple of the wool can never be of the fineſt quality: but if the heat of ſummer, in the place where ſheep are kept, does not greatly exceed the cold in winter, the wool produced in that climate will be nearly of an equal degree of fineneſs throughout the whole length of the filament, and therefore it will be, upon the whole, of a much finer quality than if the ſame wool had grown in a climate where the heat at one ſeaſon was very great. But, it is well known, that on account of the inſular ſituation of Britain, though our winters be not intenſely cold, we never experience ſuch a degree of heat in ſummer as takes place in France and other continental countries. In this reſpect, and in this reſpect alone, is Britain favoured by nature beyond other countries, in what regards the rearing of fine wool, *ſuppoſing they were equally in poſſeſſion of the ſame breed of ſheep.* And, when we advert, that, in ſome of the *northern* parts of this iſland eſpecially, the winters are ſo moderate as ſeldom to deprive the flocks from reaching their food on account of ſnow; and the heat in ſummer ſo moderate as to be no more than ſufficient to produce graſs in abundance, without danger of parching it up; we ſhall be forced to acknowledge that this is a great and ineſtimable bleſſing with reſpect to the rearing this kind of ſtock. And we ſhall ſoon ſee that nature has not been leſs liberal in providing the means for improving the quality of the wool, *ſuppoſing it was not originally ſo fine as we wiſhed it to be.* To underſtand this laſt particular fully, the following fact muſt be eſpecially adverted to:

It is a fact well known, and confirmed by daily experience, that *every diſtinct breed of ſheep, whatever qualities it may poſſeſs, continues to propagate its own kind without any* PERMANENT *variation as long as it is kept from intercopulating with other breeds of ſheep: But if different breeds be ſuffered to intercopulate, a mongrel breed is produced, which participates of the nature of both the parents, without poſſeſſing in full perfection the qualities of either. This mongrel breed may be in like manner again farther altered, by being mixed with other breeds; and ſo on in infinitum.**

2dly. By attending to this fact we ſhall be able to perceive in what reſpect *human induſtry* requires to be exerted in improving the quality of the wool of any particular diſtrict, and be made ſenſible that if this be neglected, *whatever the nature of the climate may be,* it is ſcarcely poſſible but that the quality of the wool produced there, if it has been fine to an uncommon degree, muſt be in time conſiderably deteriorated.

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* See this fact alſo proved, in oppoſition to the doctrine of M. Buffon on this ſubject. Obſervations on National Induſtry, Let. VII.

The different breeds of ſheep are diverſified almoſt without end; and they are ſo much intermixed in every country in Europe, that if the beſt breeds are not carefully attended to by their owners, and kept in flocks of one common kind covering a large extent of country, they will be conſtantly intermixing with others, and thus be greatly debaſed. The influence of climate can extend no farther in correcting this diſorder than has been already ſpecified. In the ſame climate may be found two breeds of ſheep, one of which carries wool like coarſe hair, and the other fine wool, ſoft as ſilk. This laſt breed, if perfectly ſecluded from the other, may be preſerved without degenerating for ages; but unleſs this ſecluſion, at the proper ſeaſon, be perfect, it will be every year more and more debaſed. It is, however, a fact well known to every ſheep rearer, that ſheep at the *rutting* ſeaſon acquire a ſort of *furor* of ſex, if that expreſſion will be admitted, which renders them at that time reſtleſs and active beyond meaſure, ſo that no fence, that can be made at a moderate expence for the purpoſes of huſbandry, can then keep them confined: hence it becomes a matter of very great difficulty to preſerve a diſtinct breed without adulteration, in any country where more than one individual breed is to [illegible] found; and it is next to impoſſible to preſerve a *ſmall number* of ſheep of a particular breed uncontaminated, for any length of time, in a country where other ſheep abound.* Indeed, the intermixture in this caſe is ſo unavoidable, and ſo frequent, that it ſeldom happens but the very appearance and diſtinguiſhing peculiarities of the new breed are, in a few generations, entirely loſt among the ſuperior prevalence of the greater number.† From this circumſtance it muſt ever be an enterprize of very great difficulty for the inhabitants of moſt countries where ſheep carrying wool of a coarſe quality much abound, ſo to preſerve a ſtrange breed of fine-woolled ſheep, as that their deſcendants ſhall continue to carry as fine wool as that of the parent ſtock; for as the fineſt breeds of ſheep, wherever they are to be found in foreign countries, muſt be purchaſed at a conſiderable price, and tranſported at a great expence, the original ſtock of ſuch fine breeds of ſheep that can thus be obtained, will generally be very few in number, and, by conſequence, they will be very quickly debaſed.

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* The following fact relating to this ſubject ſhews not only the ardour, but the vigour of this little animal at the rutting ſeaſon. A patriotic nobleman in Scotland had obtained a particular breed of ſheep that he wiſhed to preſerve uncontaminated. With this view he put them at the rutting ſeaſon into a deer park that was ſurrounded by a very high wall, which it was ſuppoſed no ſheep could overleap; but in ſpite of this, and every other precaution that could be adopted, the careful ſhepherd diſcovered one morning a ram of the ſort common in that neighbourhood, that had got among his fine ewes. This occaſioned great uneaſineſs. The ram was immediately taken up, and though it was known that he could not have been longer than *one night* among the ewes, my informant aſſured me he had the beſt authority for ſaying, that at the yeaning time it was diſcovered that no fewer than *eighty* ewes had been tupped by that ram; the lambs of that breed being diſtinguiſhable at the firſt glance from the others.

† It will be eaſily perceived, that from this event always taking place, mankind, who ſeldom are very accurate in their obſervations, may, in general, be readily diſpoſed to look upon this very fact as a proof of the influence of climate in altering the wool. As the ſtrange breed of ſheep ſoon acquires, in this caſe, the ſame qualities with the original breed,

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breed, the climate is, [illegible] appearance of reaſon, thought to favour that breed more than the other, and thus to produce the change. They do not advert that this change is only obſerved to take place among the young which have been there produced, and that the original ſtock, as long as they continue in life, always retain their original peculiarities as diſtinct as at the beginning. This proves that it is from a mixture of blood, and not from the influence of climate, that the gradual aſſimilation is produced.

Thoſe who have not much adverted to this ſubject will think they ſee a ſort of contradiction between what I here ſay of the permanency of the breed, and what I ſaid of the influence of the climate in altering the fineneſs of the filament of wool; but a little attention will remove this difficulty. The climate produces no *durable* change of the nature of the animal, but merely a *temporary* variation which immediately ceaſes when the cauſe that produced it is removed. The change by intermixture of blood is on the contrary a *permanent* change, that is equally obſervable in every variation of climate.

From theſe conſiderations we clearly perceive, that when France attempts to obtain a particular breed of ſheep from Britain, or elſewhere, for the purpoſe of improving her wool, ſhe has to ſtruggle with obſtructions that *nature* has thrown in her way, that are infinitely more difficult to be removed than the feeble bars that human laws have ſometimes attempted to rear; bars which by an enterpriſing ſpirit might, in all caſes, be eaſily ſurmounted. But to *Britain*, indulgent nature has been in this reſpect peculiarly kind, by having of herſelf, and without any effort on our part, effectually removed this otherwiſe unſurmountable difficulty, and thus has put it in our power to propagate any particular breed of quadrupeds we may incline, by enabling us to keep it, as long as we ſhall think neceſſary, perfectly iſolated from every other breed, without ſubjecting us to the ſmalleſt expence to effectuate that ſecluſion.

The intelligent reader will readily perceive that I here allude to thoſe numerous iſlands, iſlets, and holms, that are thick ſcattered along the weſtern and northern coaſts of this iſland. The climate of theſe ſmall iſlands is temperate and equable beyond that of perhaps any other part of Europe; and the graſs in many of them is peculiarly adapted to the rearing of ſheep. There, the flocks would be in little danger of ſuffering for want of food in winter ſtorms, as ſnow is rarely ſeen to lie there for two or three days together during the ſeaſon. Theſe iſlands are alſo of ſuch various dimenſions, that they may be found from leſs than one acre to more than a thouſand, or even ten thouſand acres in extent; and they are all ſo thoroughly fenced, that unleſs a ſheep were to fly through the air, or ſwim over a large arm of the ſea, any particular breed that may be placed there would not run the ſmalleſt riſk of being contaminated.

Theſe are advantages which France can never hope to poſſeſs, and they give to Britain a decided ſuperiority above rival nations in this important branch of rural œconomics: for here, without trouble or expence, ſhould we be able to obtain even no more than *one* male and *one* female of a particular breed, we can rear them with a *certainty* that the breed ſhall not be adulterated until it ſhall have increaſed ſo much as to admit of ſending off colonies ſufficiently numerous not to be eaſily debaſed. Here alſo the parent ſtock could be preſerved for ages, and improved; from whence the colonies could be ſupplied with unadulterated rams, and freſh drafts of ewes, to keep up the breed, which without this precaution would, in more expoſed ſituations, greatly degenerate. We have it thus in our power, without trouble or expence, to make whatever experiments we may incline in improving the breeds of domeſtick animals, either upon a large or a ſmall ſcale, as circumſtances ſhall require. This peculiarity, duly attended to and properly improved, would, in a ſhort time, give to Britain the full, and in a great meaſure the excluſive poſſeſſion of wool, finer in quality than that not only of any other part of Europe, but even ſuperior to any that can now be obtained in ſufficient quantity for manufactures in any part of the globe. Thus would our woollen fabricks become ſuperior in quality, and inferior in price, to thoſe that could come into a competition with them in any part of the univerſe. Nor are theſe idle theoretical conjectures, but undeniable facts, founded on the ſure baſis of experience and ſound reaſoning. Let us not, therefore, longer neglect to avail ourſelves of theſe ſingular advantages that heaven hath ſo bountifully conferred upon us! The means are eaſy, as the end is great.

To effectuate theſe deſirable purpoſes, I beg leave to propoſe, that a ſociety ſhould be inſtituted under the name of *The Society for improving the quality of Britiſh Wool.* This ſociety to be conſtituted on the ſame general plan with that of the Society of Arts in London; to conſiſt of an indefinite number of members, each of whom ſhould contribute *One*

Guinea a year, (this payment to be continued only during pleaſure) the money, under the direction of a committee to be choſen annually by the members, to be applied—for promoting the improvement of Britiſh wool, by offering premiums, or by any other mode that ſhall be judged more adviſeable for ſelecting the beſt and fineſt wooled ſheep that could be found in this iſland;—for procuring the beſt breeds from foreign parts that could be diſcovered, and for rearing each of theſe diſtinct breeds apart, and increaſing the number of each, till their reſpective qualities could be diſtinctly aſcertained, and their value accurately appreciated. To give ſome idea of what might be done by this ſociety, I ſhall beg leave to ſuggeſt a few more hints that have occurred to me in reflecting on this ſubject.

There exiſts in this iſland at preſent the remains of at leaſt *three* diſtinct breeds of ſheep, that are peculiarly valuable on account of the quality of the wool produced when uncontaminated by foreign mixtures, but which, in the preſent ſtate of this country, run a great riſk of being entirely loſt in a few years, if no effectual method ſhall be now taken to recover and preſerve them. The firſt care of ſuch a ſociety ſhould naturally be directed towards the recovery and preſervation of theſe valuable breeds of our native ſheep.

The firſt of theſe kinds I ſhall mention, as being perhaps the moſt nearly loſt, and as carrying the fineſt wool that has been known in this iſland, may be diſtinguiſhed by the name of the *Highland* breed. This breed of ſheep was formerly to be met with in the higher parts of Aberdeenſhire, and in all the counties of Scotland to the northward of that; but now the breed is there ſo much adulterated by intermixture with other ſorts, as to give no room to hope that any of the genuine breed could be found in thoſe parts. In the Weſtern iſlands, though for many years paſt little attention has been paid to ſheep, the original breed has not been quite ſo much debaſed as on the main land; and ſome of them might there be picked up with care tolerably good. The ſame ſort of ſheep, I have alſo been told, are found in the Orkney iſlands; but it is believed the pureſt of this breed that at preſent exiſts is in the Zetland iſles. This is a ſmall, hardy, though delicate looking animal. Its wool is remarkably fine in ſtaple; but its moſt diſtinguiſhing peculiarities are, a ſilky gloſs to the eye, and a peculiar ſoftneſs to the touch, that no other wool I ever ſaw poſſeſſes. It is not frizzled up like Spaniſh wool, but in its native ſtate is gently waved, and is rather longer in the ſtaple. When compared with the beſt Spaniſh wool that could be bought in the London market, it was found, upon a fair comparative trial, to be finer than the Spaniſh, in the proportion of nearly ſeven to four. Stockings have been made of it in Aberdeen that were ſold for five and ſix guineas a pair; and at this preſent time many pair of ſtockings are made of it each year in Zetland, which, though not delicately manufactured nor properly dreſſed, but merely on account of the fineneſs and peculiar *ſoftneſs* of the materials, ſell in the ſhops at fifteen and ſixteen ſhillings a pair. The ſheep of this breed are for the moſt part entirely white, but ſome of the ſame ſort are of a dun, or fawn colour, ſome black, but a greater proportion of a beautiful ſilver grey, with a fine gloſſy luſtre. Many of them have been much debaſed by an intermixture with a very coarſe wooled ſort of ſheep, which carries a great quantity of dry brittle hairs among the wool. This kind of hair, I am told, is in ſome places of England called *kemps*.

It will perhaps be a difficult matter to recover a pure unadulterated breed of this kind of ſheep; yet I ſhould not think it altogether impoſſible. In ſome of the ſmall iſlands they may perhaps be found very pure; for in thoſe parts the natives have ſo entirely neglected their ſheep as not to have unintentionally debaſed their breed, under the idea of improving it. Perhaps the eaſieſt way of recovering that breed of ſheep would be to offer a ſet of premiums for the beſt ewes, and the beſt rams of this kind, to be diſtributed at a place that ſhould be judged the moſt convenient in Zetland, at the moſt proper ſeaſon of the year. Theſe premiums might be, for the beſt ewe (or rather perhaps ewe lamb) carrying the cloſeſt and fineſt fleece, ſay five guineas: for the ſecond-beſt, four guineas; for the third, fourth, and fifth, three, two, and one guinea reſpectively. In like manner, for the beſt ram, five guineas; and for the ſecond, third, fourth, and fifth, four, three, two, and one guinea ſucceſſively. It being a condition, that thoſe for which the premiums are given ſhall remain the property of the ſociety, if the owner does not rather incline to keep the ſheep, and forego the premium. The price of ſheep is ſo low in theſe countries, that this ſet of premiums would probably bring together a great concourſe of the beſt of this breed, which are at preſent widely ſcattered through thoſe lonely iſles, and would afford an excellent opportunity of picking up a great number of them at a moderate price, beſides thoſe for which premiums were given.

It would be proper in this, and in all other caſes of the ſame ſort, for the judges to have along with them an expert woolſtapler, for the purpoſe of enabling them to determine with facility and accuracy which was the fineſt wool.

Another ſet of premiums exactly ſimilar to theſe might be offered in the Iſle of Skye, which is the moſt centrical place for the Weſtern iſlands. Whether it would be proper to have another ſet for the Orkneys I cannot tell, being as yet but imperfectly informed as to the nature of the breed of ſheep in thoſe parts.

The other two valuable breeds of ſheep, natives of this iſland, are thoſe that carry the long wool fit for combing, of the fineſt quality, and that kind which carries the beſt ſhort clothing wool. Both theſe breeds are natives of England and Wales: but in what places the fineſt of either breed are to be found, and what would be the readieſt way of obtaining the beſt of either ſort, other gentlemen of the Society would be much better judges than I can pretend to be.

Spaniſh wool is now in ſuch high eſtimation for manufactures, that it would doubtleſs be one of the firſt enterprizes of this Society to obtain a parcel of this breed of ſheep: and though the penalty for tranſporting ſheep out of Spain be nothing leſs than death by law, yet it will be no difficult matter to get any number of ſheep from thence that may be wanted, by a procedure it is not neceſſary for me here to explain. The only *real* difficulty will be to find a perſon who is capable of chooſing the beſt ſort, to pick them out there, who would not be liable to ſuſpicion: but this difficulty may be overcome.

It would perhaps be adviſeable to obtain from thence *at the firſt*, not leſs than fifty or ſixty ewes, and ten or twelve rams. By obtaining ſuch a number at once, the breed would not only be the more quickly increaſed in Britain, but a chance would alſo be given to correct any error that might be made in chooſing them; as it is not probable, that among ſuch a number there would not be ſome individuals of the fineſt ſort, that might be ſeparated from the reſt to keep up the *pureſt* breed. The ſupernumerary rams too, might be put to the pick of our own ewes, to improve their wool by the croſs breed. As the firſt coſt of theſe ſheep in Spain would not be great, and as the expence of tranſporting them hither would not be conſiderable, it would perhaps be right to obtain a ſtill greater number, if the ſociety's funds were adequate to it; as the nation would thus the ſooner derive a benefit from this improvement.

The Spaniſh ſheep not only afford a fine wool, but, as they are a large, ſtately, full-bodied animal, they would, if well choſen, be valuable on account of their carcaſe as well as their fleece.

Another breed of ſtately, well-bodied ſheep, that likewiſe carry fine wool, are to be met with in Barbary, and would, no doubt, claim the early notice of the ſociety.

It is not to be expected that the *Tarentine* ſheep will now, after ſo many ages of neglect, carry as fine wool as in the time of the ancient Romans, when it was ſo highly celebrated: but we are aſſured by modern travellers, that theſe ſheep are ſtill diſtinguiſhed above all others in thoſe regions for the fineneſs of their fleece. It would therefore be proper to try to obtain a few of the beſt of this breed: and though the wool that they produce in their native country ſhould perhaps be found to be coarſer than ſome of the fineſt of our own, this ought not to bar the trial, as there can be little room to doubt that it would be conſiderably improved by rearing theſe ſheep in our colder climate. This obſervation will alſo apply to the ſheep of Barbary, and all others that come from warmer regions than our own.

The only other breed of European ſheep I have heard of, that promiſes to anſwer our preſent purpoſe, is one that has been lately diſcovered in the Crimea, which carries a fleece of a grey colour, and very fine quality: but it is not yet enough known to enable us to ſpeak of it with any degree of certainty. It is, however, well worth enquiring after, on account of the warmth of the climate, as it would probably be greatly ameliorated by being tranſported hither.

The fineſt wools, however, that are brought to European markets are the production of Aſia. *Perſia*, *Caſhemire*, and *Thibet*, are the countries from whence they come; and it would be an object of great importance, and highly worthy of ſuch a ſociety, to obtain ſome of the beſt breed of the ſheep of each of theſe countries. This muſt, indeed, be a work of time, and will be attended with difficulties and expence; but theſe difficulties are not of ſuch a nature as to be unſurmountable. The ſheep is an animal that, when young, can be eaſily tamed, and can become ſo entirely domeſticated as to follow man like a dog, partake with him in any kind of vegetable food, and lie in his chamber. To ſheep ſo trained, a journey either by land or by ſea, is not a matter of great hardſhip; and in this way they may be brought hither. Some of the Thibet ſheep have already found their way into Bengal, where they never can be of any uſe; but none of them have yet been imported from thence into this country. Travellers mention an animal of that country of the goat kind, called *Touz*, which carries a fleece much finer than the wool of their ſheep. Enquiries ſhould be made if ſuch an animal exiſts, and if it does, ſome of them, if poſſible, ſhould be brought to this country; as there is little reaſon to doubt but they would here proſper abundantly.

The *Paco* and *Vicuna* of South-America, commonly called *Peruvian ſheep*, though they be, ſtrictly ſpeaking, of the camel tribe; yet as they carry wool of the nature of that of ſheep, only finer in quality, ſhould alſo be attended to by the ſociety. Could a few of theſe animals be obtained here, there is great reaſon to believe they would thrive very well in Britain, as they naturally delight to dwell only in the cold regions of the Andes, and have been found to do very well at Aranguez in Spain, where a few of them have been kept for ſeveral years paſt merely as a curioſity. Could we produce a ſufficient quantity of this kind of wool, at a moderate price, it would give many of our *fineſt* manufactures a prodigious advantage over thoſe of our rivals, as is ſufficiently obvious.

The only other animal that occurs to me, as carrying a fleece uſeful in our manufacture, is the Angora goat.* This kind of goat has been reared in France and in Sweden; in both which places it thrives as well as in its native country, and carries the ſame kind of long ſilky fleece. There cannot therefore be a doubt but it would thrive here alſo: and it could be kept from intermixing with other breeds of goats in the ſame way as the ſheep. It is probable the moſt rocky and inacceſſible iſlands, if ſtocked with this claſs of animals, would return a much greater profit than they could be made to yield in any other way, were the fleece ſold even at only half the price it now yields in Britain. This animal therefore ſeems to be highly deſerving the attention of the ſociety.

To be prepared for receiving and propagating theſe different breeds of animals when they can be obtained, it will be neceſſary for the ſociety, immediately after its inſtitution, to provide a proper theatre for theſe experiments. Many places might be pointed out as being well adapted for the purpoſe here wanted; but thoſe which, upon the whole, appear to me the beſt, are the iſlands on the weſt coaſt of Mull, in Argyleſhire. Theſe iſlands are numerous, many of them ſmall, and yield excellent paſture. On theſe the parent breeds might be placed, perfectly ſecure from all danger: and as other larger iſlands of various dimenſions lie near them, the ſtock might eaſily be removed to theſe, when their increaſe was ſuch as to require it, and would ſtill continue to be under the eye of one ſuperintendant. As moſt of theſe iſlands belong to the Duke of Argyle, who is at all times diſpoſed to patronize and encourage every plan that promiſes to be beneficial to the country, there can be no doubt but he would be ready to grant to the ſociety every accommodation that could be *reaſonably* expected from him. And though the ſociety would no doubt pay a rent for ſuch land as they acquired, yet if that rent were not greater than what is uſually paid for ſuch land in that country, they would find no difficulty in getting ſuch iſlands as they had not immediate occaſion for, let, at the ſame rent from year to year, till they ſhould find it neceſſary to occupy them themſelves. As for thoſe iſlands that were ſtocked by the new breeds of ſheep, I do not ſuppoſe the loſs by them, if any thing, could be great; for rents there are low, and the wool, it is to be ſuppoſed, would ſell at very high prices compared to what it [illegible]ings there at preſent; ſo that if this department were managed with an ordinary degree of ſkill and honeſty, the expence incurred there would probably be altogether, or very nearly, repaid by the produce of the flocks. Under the management of an individual, for his own account, the return would no doubt be much more; and, after the ſheep were once obtained, the breeding of them might prove, to ſuch individuals, a buſineſs highly lucrative; but under the direction of a publick ſociety, this ought not to be looked for. Individuals, however, who poſſeſs the iſlands ſcattered around theſe, would have an early opportunity of procuring the beſt breeds, and would no doubt quickly avail themſelves of the benefits that might be derived from that ſource. It would be no ſmall advantage to them to be able to ſend their wool to market along with that belonging to the ſociety.

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* I hope no apology will be thought neceſſary for taking notice of theſe animals, which are not ſtrictly of the ſheep race. In a diſquiſition of this kind it is the nature of the material, not the claſs of animals which produces it, that ought to be chiefly adverted to. All theſe materials are ſufficiently analogous to be, without impropriety, admitted in this eſſay.

If ever this ſociety ſhould be inſtituted, it would ſeem, for many very obvious reaſons, that *London* ought to be the place where it ſhould be conſtituted, and where a ſecretary ought perpetually to reſide, who, under the direction of the committee, ſhould tranſact the buſineſs of the ſociety; ſend the neceſſary commiſſions to foreign parts, and iſſue orders to the domeſtick overſeer for regulating his conduct.

It will be unneceſſary to dwell upon the benefits that would be derived to this co[illegible]ry from an inſtitution of the nature here propoſed, theſe being abundantly obvious. It ſeems indeed to be not a little ſurpriſing that a thing of this kind ſhould not have been thought of long ago. This can only have been occaſioned by the fatal prevalence of thoſe falſe notions, that have been ſo long induſtriouſly propagated, concerning the ſuperiority of Britiſh wool above all others;—an abſurd notion that has been long eagerly cheriſhed, though it is directly contradicted by our daily experience.* It is owing to this cauſe alone, I apprehend, that the ſubject has never hitherto properly attracted the publick attention. It is to be hoped, that when it does come to be properly adverted to, men of liberal minds in every [illegible]nk of life, perceiving its great importance, and obſerving at the ſame time the *trifling effort that is required to confer the moſt ſolid advantages on their country, will emulouſly* preſs forward to obtain an honourable place among that liſt of patriots, whoſe names will doubtleſs be preſerved to future ages by a grateful people, who, while they enjoy the benefits this aſſociation has conferred upon them, will with ſocial joy celebrate their praiſes. And though there can be no doubt but the efforts of individuals would be altogether ſufficient eaſily to effect theſe ſalutary purpoſes, without any public aid, or royal aſſiſtance; yet it would be highly unbecoming of thoſe who ſhould plan ſuch a laudable inſtitution not to ſolicit the royal patronage, and to put it in the power of the King, or the Prince of Wales, to have the honour of being the patron of an undertaking ſo ſuitable to the diſpoſitions of thoſe who glory in the titles of the father and the friend of their people.

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* That Spaniſh wool has been long an article of import into this country every perſon knows, but few know exactly the amount of that trade, or the ſums of money that are annually ſent out of this kingdom for that article, moſt of which is conſumed in cloathing ourſelves. By an account that was laid before Parliament laſt year it appears that, on an average of ſeveral years paſt, about three millions of pounds of Spaniſh wool have been imported by us; but that the amount of this importation is augmenting from year to year, and that in particular, in the year 1787, no leſs than four millions one hundred and eighty-eight thouſand two hundred and eighty pounds of Spaniſh wool were imported into Britain, the value of which was upwards of *ſix hundred thouſand pounds*. An immenſe ſum to be *needleſsly* given by us for the purpoſe of encouraging the agriculture of Spain, that might be infinitely more beneficially employed in augmenting the products of our own fields, and promoting, by the cheapneſs of the raw materials, the manufactures and the commerce of this country!

The effects of the *royal bounty*, in improving the breed of another valuable claſs of animals, *the horſe*, are well known. By a ſimilar bounty in the preſent caſe, though much more limited in extent, effects ſimilar in kind, but of infinitely greater national importance, might be expected to be produced.

May the happy time ſoon arrive, when the *ſheep* of Great-Britain ſhall as much excel the ſheep of all other nations, in reſpect to the fineneſs of their *wool, and other valuable qualities, as the horſes* of this iſland now *confeſſedly* exceed all others in ſwiftneſs and in bodily ſtrength! Nor have we room to doubt, that with an equal degree of attention and care, the former event would be much ſooner effected than the latter has been compleated, ſince it has been clearly demonſtrated, that our climate is naturally ſuited beyond moſt others for the production of *fine wool*; and our circumſtances in other reſpects uncommonly favourable for its improvement. Though, with regard to horſes, this iſland being able to boaſt of no peculiar natural advantages, the pre-eminence ſhe holds in this reſpect muſt be confeſſedly the reſult of continued care, and unceaſing attention alone.

ARTICLE XII.

The two following papers, furniſhed by a gentleman well known and reſpected for his abilities in the improvement of Craſs Lands in the county of Somerſet, we give in his own ſtyle and manner. The firſt of the two, if examined with the ſtrictneſs of agricultural criticiſm, may be liable to ſome animadverſion, on account of the extraneous matter with which it *is accompanied in the* notes; *but as they take up but little room, and may ſerve to illuſtrate the ruſtick character of a conſiderable part of the ſubordinate claſſes employed in the huſbandry of the county, they are admitted. The information, indeed, is not to be conſidered as of any great conſequence to the practical farmer; but as in converſation, ſo in reading, thoſe anecdotes of pleaſantry which happen to be excited by local ſubjects, are not without their uſe in relieving the mind from the uniformity of ſeverer ſtudies. Some of our readers will* ſmile, *not diſagreeably to themſelves; and we truſt no one will be offended at the peculiarity of a writer with whom many may hope to be better acquainted. The communications of Mr. Locke, ſo far as they reſpect improvements, we are informed, are the reſult of practice founded on his own reflections, unaided by the peruſal of agricultural authors; and therefore they have the recommendation of the greater originality.—We ſhall be glad of his further correſpondence, more eſpecially if his profeſſional line ſhould furniſh him with uſeful obſervations on the diſeaſes and management of cattle in low marſhy countries, as well as the lands on which they feed.*

On the Improvement of Meadow Land;—with a ſhort Hiſtory of a part of Somerſetſhire.

[By Mr. Locke, in a Letter to the Secretary.]

Sir, *Burnham, Feb.* 2, 1789.

I Promiſed in my laſt letter to give you ſome account of the methods I have made uſe of for theſe forty years paſt towards the improvement of Meadow Land; previous to which I think it neceſſary to preſent you with a ſhort hiſtory of the flat part of Somerſetſhire, wherein I was born and have always lived. *Brent* and *Banwell's Marſh*, as it is called upon the old maps and records, but at preſent better known by the names of the *North* and *South Marſh*, with ſome few pariſhes adjoining, comprehend all the lands ſituate between the Mendip and Poledown hills, quite home to the Briſtol Channel; containing together 42 pariſhes, compoſed of the hundreds of *Bempſtone*, *Brent cum Wrington*, *Winterſtoke*, *Hun'ſpill cum Puriton*, and part of *Whitley* and *Glaſton Twelve Hides*.

I have taken an actual ſurvey by admeaſurement of a great part of theſe lands; and, eſtimating the pariſhes I have not ſurveyed in their due proportion, I find the whole together will amount to about 3000 houſes, 20,000 inhabitants,* and 128,000 acres,

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* I have counted the inhabitants of about twenty pariſhes, and eſtimating the others after that rate, they may be divided as follows:

Huſbands	2,500	Wives	2,525
Widowers	600	Widows	1,000
Batchelors	700	Spinſters	500
Sons	4,500	Daughters	3,500
Male-ſervants	950	Female ſervants	1,025
Male apprentices	400	Female apprentices	400
Male lodgers	850	Female lodgers	800
Total males	10,500	Total females	9,500

acres, the waſte land included. To the above add the low lands watered by the Tone, Parret, Ivel, Bru, Brent, Ax, and the Congre, all which rivers diſcharge themſelves into the Briſtol Channel, and we ſhall have 128,000 acres more at the leaſt. A conſiderable part of theſe lands are included in King *Arthur*'s* grant to the abbeyat Glaſtonbury, dated 21 May, 542, in addition to that which King Arviragus had given it before. Ina, eleventh king of the Weſt Saxons, anno 704, built the firſt church at Wells, where the cathedral now ſtands, and from his grant in *Dugdale's Monaſticon*, dated 725, it appears that he gave great poſſeſſions to the church of Glaſton; and *Kenulphus* the fourth king after him granted, anno 766, a tract of land containing two large manors for the ſupport of *Ina*'s church at Wells. The old charter of en[illegible]vment may be ſeen in *Godwin's Biſhops*.

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* King Arthur, ſon of Uter Pendragon, who was the brother of Aurelius Ambroſius, having fought a great number of battles, and performed a variety of noble acts, was himſelf ſlain at Camelford, in Cornwall, by Mordred, ſon of Gouran, King of the Scots, whom he had by Anna, one of the aunts of Arthur. [See *Ninius* and *Marianus Scotus*.] His body, in the 36th of Henry II, anno 1189, was found buried at Glaſtonbury, with Gunever his queen. Giraldus Cambrenſis, the hiſtorian, was an eye-witneſs to the finding theſe remains. The lead cover was preſerved in the treaſury of Glaſtonbury till the ſuppreſſion of its abbey by Henry VIII. on which was a Latin inſcription in rude letters, thus engliſhed, "Here lieth King Arthur, buried in the iſle of Avalonia." See *Stow's Annals*.

I do not recollect whether the term Brent be in King Arthur's grant; but if ſo, it contradicts the received opinion that Brent marſh took its name from Le Sire de Breant, a famous Knight Archer, who came into England at the Conqueſt. See *Hollingshed*.

The earldoms or counties of England muſt have been ſubdivided before *Honorius*, the fifth archbiſhop of Canterbury, divided his ſee into pariſhes, anno 636; and it is a doubt with me whether King *Alfred*, who died in 901, did not improve, or rather compleat, the plan of ſome of his predeceſſors in dividing the kingdom of England into hundreds and tithings; for I cannot conceive that the hundred of *Williton Free-Manors*, which contain 31 pariſhes, and the hundred of *Taunton-Dean*, which conſiſts of 30 pariſhes, (and which was the reſidence of King *Ina* near a century and a half before *Alfred*'s time) had each ſo few as one hundred houſes in it when this ſubdiviſion took place. However this be, we can, with the aſſiſtance of Domeſday-book, old Peerages, Dugdale, Tanner, Camden, Speed, and ſome other itineraries, trace moſt of thoſe manors and pariſhes that compoſe theſe marſhy lands to, and ſome beyond, the Conqueſt. Amongſt theſe are, *Wedmore*, where Alfred ſometime reſided; *Auler*, where the Daniſh King Gothrum met Alfred to be baptized; *Banwell* and *Congreſbury*, which King Edward the Confeſſor gave to Dudoco, the fourteenth biſhop of Wells, as an addition to his ſee. *Yatton* and *Winſcombe* were added at the Conqueſt to pleaſe Biſhop Giſo, from whom King Harold had taken part of his lands, and gave them to the monaſtery of Glouceſter. Biſhop Joceline,* who founded the Prebends and Chapter of Wells, added to his ſee the pariſhes of *Chedder* and *Axbridge*; the laſt gives name to the deanery, in which the chief part of theſe marſh lands are ſituated.

Amongſt other pariſhes of great antiquity is one called *Bleadon*, a corruption of *Bloody-Down*, ſo called from the great ſlaughter of the Danes by Ernulph, the ſuppoſed ſon of Hun ſecond earl of Somerſet, anno 845. Indeed, if we examine antiquity, we ſhall find that in the names of all places ſo ending, *don* is only a corruption of the word *down*, juſt the ſame as *ton*, at the end of other places, is a corruption of the word *town*; from whence we may conclude, that the pariſh of *Lockſton* was originally the dwelling or town of *Locke* perhaps long before the Conqueſt. ‘*Lockſend* (now corrupted to

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* This Biſhop is ſaid to have given an eſtate in Bath, called *Saint John's Farm*, valued at 60l. per annum, for the ſupport of ſix widower men, ſix widow women, and a purveyor; which farm I was employed to ſurvey in the year 1774, and it was then ſo much improved by buildings as to be worth little leſs than 10,000l. per annum. It is at preſent called the *Blue Alms Charity*; and notwithſtanding the marvellous increaſe of rents, it is ſtill appropriated to the maintenance of *thirteen* people only!

Locking, as if a participle) was one end of the poſſeſſions of *Locke*, as alſo *Lockſend*[illegible]*ad*, *Lock's Weſt-Town*, now called *Weſton above the ſea*, and many others of like import. Adjoining Lock's-Town on the Eaſt is a pariſh lying between two hills called *Comb-Town*, which in all probability the proprietor of Lock's-Town beſtowed as a gift upon one of our ancient Biſhops, being at preſent called *Compton-Biſhop*, and dignified with having a prebend's ſtall in the cathedral church of Wells. The ſame obſervations may be made on the lands adjoining called *Winterton*, *Winterſcombe*, *Winterhead*, *Winterhill*, &c. all which names ſeem to ſignify to us that the villages thus called were one time or other the property of one *Winter*, unleſs we can ſuppoſe them to have been called thus from the ſeaſon of the year.

It may be obſerved, that moſt of theſe pariſhes, which have the appearance of antiquity, have a ſmall portion of land higher than the marſhy parts, and the churches are built upon ſuch places as were not likely to be overflown by the ſea. Indeed the whole of theſe marſh lands, which comprehend the quantity of acres contained in twenty miles ſquare, were one part conſtantly, and the other frequently, overflown either by the ſea or land floods, until the reign of Henry II. when banks were made to keep back the tide; but it was not till the reign of Queen Elizab[illegible], that the no leſs famous than uſeful dam called *Highbridge* was built, having three large arches ſufficient to drain the country, with flood-gates of ſuch ſtrength as to keep back the tide; ſo that we frequently ſee the water on the Weſt ſide of the bridge lying againſt the ſea from twenty to thirty feet higher than it is on the Eaſt or land ſide.

Perhaps this draining the land gave riſe to ſome new pariſhes; their very names ſeem to indicate as much, viz. *Chad Sea*, i. e. the land late a ſea, dedicated to *St. Chad*; *Middle Sea*, lying between the pariſh of *All Dry*, (now *Audry* or *Othery)* and *Weſt-town Sea and Land*, (now *Weſtonzoyland*) *Badgewarth*, that is, the *warth* (or *warf* as anciently ſpelt) of *Badge*; *Hunt's Pill*, that is, the *Pill* of *Hunt*, and ſo of others. It ſeems as though *Lympſham*, together with *Burnham*, *Berrow*, and *Brean*, whoſe churches ſtand within a few yards of high water-mark, are ſtill more new; nay, the two pariſhes of *Biddes-ham* and *Aller-town* were, long ſince the Revolution, actually chapels of eaſe to *Wedmore*; and the flouriſhing pariſh whoſe church is dedicated to *Saint Mark*, is a ſpurious iſſue of that ancient place; for although it has 800 ſouls in it at this time, the publick knows it by the name of *Mark* only, without any ſurname; and it is leſt totally unnoticed as a pariſh in Bacon's n[illegible]s well as every other edition of *Ecton*'s Theſaurus.

I am the more convinced the flat country I am deſcribing was once overflown by the ſea, from the names given to certain places in it. Joſeph of Arimathea and his followers, according to *Trecutas*, lib. ii. cap. 4, had as much land given him as could be ſurrounded by twelve ox-hides cut into ſmall thongs, which he at firſt called *Yniſytrin*, but afterwards the Iſland of *Avalon*; at preſent it is called *Glaſton Twelve Hides*. The high hill called *Brent-knoll* (on the top of which was a Roman garriſon*) was ſtiled by the monks of Glaſtonbury, in an ancient grant of theirs, the *Little Iſland of Frogs*,† and became famous for giving birth to the noted *Adam de Mariſco*, i. e. *Adam of the Marſh*, an author of great piety and learning, who flouriſhed in 1257. Beſides the above iſlands, there are a great number of villages, farms, and places, called *Iſlands*, *Iſle-ports*, *Hills*, *Mounts*, *Batches*, *Warfs*, *Warths*, and *Waths*, with the epithets *great*, *little*, *long*, *ſhort*, *high*, *low*,

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* The top of this hill contains about ten acres, having been ſurrounded by a thick wall, the traces of which are now viſible; and within my own remembrance there was a large quantity of Roman coins found upon it, ſo that I cannot doubt of its having been a Roman ſtation.

† See John Rouſe.

hither, yonder, over, under, ſupra, ſubter, nether, eaſt, weſt, north, ſouth, white, black, yellow, green, &c. all of which contribute to prove this flat country to have been once a ſea. But if we may in this caſe rely upon tradition, for the digging up of ſhip's anchors many feet under ground in the marſhy places, there cannot remain any poſſibility of doubt.

I have ſeen ſome grants of William I. and grants of manors ſoon after the Conqueſt, which I could both read and underſtand. They were not much unlike the long narrow chyrographs of fines wrote in Law-Latin Court-hand;* but I do not recollect to have ſeen in the leaſes of tenements for lives under theſe grants, any particular boundaries ſet forth, till ſince the diſſolution of monaſteries at the Reformation; and from hence I conclude that this flat country was no otherwiſe bourded than by ancient grants of manors, each of which was gelt at a certain number of hides.† and was under the feudal tenure held in villenage* by the vaſſals of the great Lord, who for the moſt part held[illegible]der the Crown by knight's fees and war ſervices.

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* I have now in my poſſeſſion one of theſe Law-Latin Court-hand chyrographs, acknowledged in Hil. term, 4th William III. between Francis Carſwett, Doctor in Divinity, and vicar of Bray in Berkſhire, (the turn-coat vicar of Bray) plaintiff, and John Friend, of Taunton Saint Mary Magdalen, defendant.

† How ſhall we reconcile the very great difference at preſent ſubſiſting between thoſe authors who have laboured to aſcertain the quantum contained in a hide of land? ſome having fixed it to be fifty acres, whilſt

To

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whilſt others have as confidently called it a hundred. Perhaps both of theſe are right; for if we look into Domeſday-book, we ſhall find one gentleman's manor gelt for twenty hides, which at preſent contains twenty hundred acres; and another gentleman's manor gelt at twenty hides, that contains only ten hundred acres. The fact is, a hide of land was juſt ſo much as could be tilled with one team, and ſo was more or leſs according to the induſtry of the proprietor or proprietors; for ſometimes there were as many as ſix vaſſals to one hide, each of whom contributed his ſingle ox, from whence the term ox-gang, or ox-ſhut, in certain incloſed paſtures; and hence it is too that we find ſuch a number of ancient tenements from ten to twenty acres each, which was exact one-ſixth part of a hide of land. Great allowance muſt alſo be made in regard to the quantum contained in a hide, for the lands which lay uncultivated at the Conqueſt may at preſent be in a high degree of culture; no wonder therefore that in this flat country (a great part of which hath been new made ſince the Conqueſt) we ſometimes find the average hide of a manor to contain ſeveral hundred acres. The price of a hide of land a little before the Conqueſt was fifty ſhillings.

* One branch of this ſervice, as it was introduced before and at the Conqueſt, in a few particular places in England, gave the Lord a privilege of ſleeping with his tenant's daughter the firſt night after marriage; but the good Queen Margaret, grandaughter of Edmund Ironſide, and mother-in-law to our Henry I. in conſequence of her marriage with Malcolm king of Scotland, did, for a round ſum of money, compound with the great Lords of that kingdom to aboliſh a prepoſterous cuſtom big with evil againſt nature and civil liberty; and King Henry ſo far followed his mother-in-law's example, as to diſcountenance it in England, by wholly freeing ſuch of his ſubjects who laboured under this heavy yoke, upon their paying 6s. 8d. which was indeed ſuch a pitiful price for a woman's virginity, that the cuſtom

very

To every manor belonged a manſion with more or leſs land in demeſne incloſed near it, always ſufficient for the maintenance of the family, without the lord's being under the neceſſity of intercommoning with his tenants; and this is the only reaſon that can be adduced why the manor-houſes are at this day precluded all intereſt and advantage ariſing from the multiplicity of new incloſures under different acts of parliament for that purpoſe. The demeſne ſeems to have been the only land identified, except the old *auſter** tenements and their homeſteds,

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very ſoon became univerſally aboliſhed. But this libidinous privilege of the lords of ſome manors had taken ſuch deep root in the minds of ſome of their vaſſals, that they had their younger ſons preferred before the elder,—a borough Engliſh practice that is ſtill kept up in many parts of England, particularly about thirty pariſhes in Somerſetſhire, lying in the hundred of Taunton-Dean, the cuſtoms of which I ſometime ſince publiſhed, price 2s.

* *Auſter* being a provincial term, not intelligible by gentlemen at a diſtance, it may not be amiſs to acquaint them that it is peculiarly applied to ſome parts of this flat country. The term itſelf is differently ſpelt in different grants; whence the learned have given us many different conjectures of its derivation, moſt of whom believe it purely Saxon; but whether ſo or not, its true original import ſignified an oven, for want of which a hearth or fire-place, but of ſuch a conſtruction that it muſt be capable of baking bread. All ſuch villanes who in early times would venture to live on thoſe marſhy lands, and erected a cot of ſuch conſequence as to have a hearth or oven that would bake their own bread, had a privilege of unlimited intercommoning, provided they poſſeſſed themſelves of one ox, and cultivated a ſufficient quantity of ground to find themſelves and families in corn.

homeſteds, for the manor was generally divided into three large incloſures, called [illegible] *ham*, a *meadow*, and a *field*. In the ham all the tenants fed their cattle in common during the ſummer ſeaſon, after the ſame manner as commons in graſs are fed at preſent. For winter fodder, all the tenants, the firſt day after the Nativity of St. John the Baptiſt, mowed promiſcuouſly in the meadow land, commonly beginning at twelve o'clock at night, and continued mowing where they pleaſed according as their judgment pointed them to the beſt graſs; but if a tenant ſurrounded more land than his ſtrength enabled him to mow in twenty-four hours, any neighbouring tenant who had finiſhed mowing the piece he had marked out in the morning, had a preſcriptive right to break in upon ſuch ſurrounded land for the laſt hour or two, more or leſs, and continue mowing till the twenty-four hours were fully expired. The more wet or poor parts of the ſame mead might be mowed at any time, and by any tenant who ſuppoſed his ſingle day's mowing inſufficient to ſupport his cattle in the winter.

A full day's mowing was emphatically called a Mead, and when the tenements came to be identified and bound-ſtones ſet up, they were always eſtimated at five acres each. I have ſurveyed ſome hundreds, perhaps thouſands of thoſe meads, and find them to contain from three to three acres and a half each, ſtatute meaſure.

In ſomewhat after the ſame manner the farmer tilled his arable land; for the chief villager, or earlieſt riſer, began to plow in the common field where he pleaſed, drove on till his cattle wanted breath, and then turned about; which commonly happened at the length of one-eighth part of a mile, from hence called a furlong, ſo the full day's work of the team was at the cloſe of the evening called an acre.* Sometimes the plowman No. 1, owner of one ox, happened to be beat off by the rain at the end of half a day, in which caſe the plowman No. 2, who alſo owned another ox, began plowing at the ſame place, and ſo reduced the bit of land No. 1 to half an acre, nay ſometimes to a ſingle ridge or dole, commonly called a yard or plot, it being an indefinite term ſignifying one quarter of an acre, more or leſs. But the catching after land thus, as ſchool-boys do for nuts, was, ſoon after the diſſolution of monaſteries, found inconvenient, which cauſed the great lords to aboliſh, in a great meaſure, their old feudal tenures; and inſtead of ſo zealouſly diſtinguiſhing themſelves by red and white roſes, proceeded to incloſe and identify their lands, on which they granted leaſes by the particular deſcription of all thoſe ſeveral pieces and parcels of arable and meadow, which were at the time of granting thoſe leaſes actually in the occupation of the leſſees, which leſſees were not thereafter to be moleſted by any perſon whatever, together with an unlimited common of paſture in the ham or moor for the ſummer feeding of cattle. Theſe old auſter tenements were generally held for 99 years, determinable on the death of three lives; and at firſt under the eaſy annual rent of wheat, barley, oats, hay, cattle, geeſe, ducks, capons, wild fowl, cummin ſeed, &c. and on the death of the oldeſt life the beſt beaſt was generally advanced by way of fine *for a life*, and from thence called *farlief*, but long ſince compounded for money, and at preſent called a *heriot*.

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* If the curious agriculturiſt will be pleaſed to attend to this circumſtance, and recollect that we had no ſtatute meaſure except the yard, whoſe length was determined by the length of the arm, he will readily be able to account not only for the difference in ſize of the acres in almoſt every country, but alſo for the ridiculous irregularity of fences and intermixture of property, to the very great injury of the different proprietors, and emolument of none but gentlemen of the long robe.

The great Lords thus incloſing and identifying their tenements, this flat country gave great offence to the tenants, whoſe privilege of picking and chuſing the beſt land was now at an end; they therefore ſent a petition to Edward Seymour, the great Duke of Somerſet and Protector of England, complaining of the Lords' incroachment upon their privileges. The Duke iſſued out a proclamation for the levelling theſe incloſures, by a day therein-named; which not being complied with by the *Lords, the tenants took* the liberty of doing it *themſelves;* and this brought on an *inſurrection in Somerſetſhire in the ſecond year of the reign of Edward VI. The mob behaved very much* after the ſame manner as the Iriſh white-boys *did* a few years ſince, from the ſame motive; but ſome of them having received exemplary puniſhment, the reſt were pardoned, and returned to their allegiance. I never ſaw a feoffment or a grant in fee of ſmall tenements, or portions of land, identified and bounded, prior to this æra; but in the ſucceeding reign we have them in great abundance, from which, with the aſſiſtance of the publick ſurveys, we may in a great meaſure diſcover the value of money between that period and the preſent time. If we examine the King's *liber valorum*, as taken for Somerſetſhire by Dr. John Clark biſhop of Bath and Wells, Sir William Stourton, knight, Hugh Powlett, William Portman, and Roger Kynſey, eſquires, in the thirty-fifth year of Henry VIII. we ſhall find this flat part of Somerſetſhire (herein before eſtimated at 256,000 acres) to be valued at about thirty thouſand pounds per annum, which is almoſt half-a-crown an acre upon an average. At the Revolution we find the value of theſe ſame lands increaſed to about ſeventy-ſix thouſand eight hundred pounds, which is ſix ſhillings per acre upon an average: at preſent I value this tract of country at thirty ſhillings an acre, one with another; and from the minuteſt and beſt calculations I have been enabled to make in the courſe of forty years experience upon the ſpot, acting in the three-fold capacity of a conſiderable farmer, a practical agriculturiſt, and a land-ſurveyor, I adduce one general eſtimate, which may be arranged as follows:

Acres		Pounds per annum.
20,000	acres of rich paſture land in a high degree of culture, ſtatute meaſure, excluſive of fences worth 2l. 10s. per acre per annum	50,000
30,000	acres of uneven paſture land in large cloſes, formerly arable, laid out to graſs in ridges 20 feet wide, in other reſpects as rich as the former, worth 2l. per acre - - -	60,000
60,000	acres of paſture land, which ought to be made into cloſes from 10 to 30 acres each, and ſo exchanged as to make farms within ring fences, in which caſe, it might, by good management, be made worth 2l. per acre in two years, worth at preſent 1l. 10s. per acre - - - - - - - -	90,000

Acres.		Pounds per annum.
76,000	acres of meadow land conſtantly mowed, either under jointure, mortgage, uſes, or remainders over unbarred, or belonging to leſſees for lives, tenants for life by curteſy, joint common, or in tail, or ſome other impediment, which will effectually prevent the farms from being brought by exchanges within ring fences, and be thereby improved, worth 1l. 10s. per acre - -	114,000
70,000	acres of neglected land belonging to ſome charity, church, college, or dignitary, lying in ſmall irregular pieces, being either coarſe, wet, intermixed, undivided, ill-ſhaped, uneven, at a diſtance from houſes, with bad roads, moors, unincloſed, and other uncultivated property, worth only 1l. per acre - - - - - - - - -	70,000
256,000 acres.	Total annual value	£.384,000

I would not be underſtood to include in this calculation any ancient common field lands now in tillage, or lands that lie above ſpirit level higher than high-water mark. The calculation is made from neat ſtatute acres, excluſive of fences and uncultivated corners; and the land-owner is to allow out of this eſtimate every kind of agricultural repair, and incumbrances of all ſorts, with which the land, or occupier thereof, ſtands charged according to the cuſtom of t[illegible] country, ſo that the tenant has no payment whatever to make but rent only.

If the above calculation be admitted as founded on fact, the proportion of money will be as one to twelve from the Reſtoration to the preſent time. I know the clergy in their comments upon the valuation of the King's *liber valorum* add a cypher upon the right hand, which only makes the proportion to be as one to ten; but this is merely arbitrary, without calculation. In anſwer to which I do not recollect to have ſeen any grant whatever in Queen Elizabeth's reign, where the premiſes conveyed are not worth at preſent as many thouſands as the conſideration money was hundreds. Indeed *Pill's-Mouth Farm*, where I drew my firſt breath, worth at preſent 100l. per annum, coſt my grandfather's father in the reign of Charles II. only 200l. in fee; which farm was purchaſed of the lord of the manor* in the reign of Queen Elizabeth

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* The Popham family were lords of Burnham in the laſt century, and we have a tradition amongſt us, that an anceſtor of this family, when a young univerſity blood, in company with two jovial companions, made too free with a gentleman's purſe upon the road. Soon after Popham repented, and his companions thought nothing leſs than a diſcovery would follow, which in order to prevent they led him into a wood,

for the ſum of 25l. only. It is true it lies againſt the ſea, and has been occaſionally ſubject to inundations by the overflowing of the tide, the laſt of which was anno 1737, and the next before that anno 1703.*

Having

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a wood, faſtened his hands behind him, fixed one end of a halter round his neck, the other end to a limb of a tree, and in this ſituation left him ſeated upon his horſe. Popham was under dreadful apprehenſions of his approaching fate, and ſo much the more as the graſs grew ſhort on which the horſe had for a time very quietly fed; but he now began to ſtretch the rope by extending his circuit, and Popham, who had been humouring him with a jockey-whiſtle, began to cry out in great agony of ſoul, *Ho! Ball! ho! Ball!* but at the very inſtant he was about to ſwing off, he was relieved by one of his companions, who had divided from the other, and was returned back for that purpoſe. It happened that in a ſeries of years Popham became a Judge, before whom his companion who had ſaved his life was convicted for a capital offence, and being aſked why judgment of death ſhould not paſs, he mimicked the Judge's former tone of voice, and cried out *Ho! Ball! ho! Ball!* The Judge, who now recollected his face, told the Court that the priſoner appeared to be inſane, and that he would reſpite ſentence till next aſſizes, before which he found means to get the culprit pardoned and provided for.

* The manners of the inhabitants of this flat country cannot ſo well be judged of by a ſtranger as a native; they are civil or rough as the traveller pleaſes. Take an example founded on fact:—

" *Q.* Hark you, fellow, which is my road to Frog-hole? *A.* What's call I fellow for? I, I, I, zed nothing to thee. *Q.* Well, my good man, I would not have you be offended, for I did not mean to affront you, but pray do tell me the road. *A.* Whare didſt thou come from than? *Q.* Why, my honeſt friend, can it make any difference to you from whence I came? *A.* No ſhour and ſhour, but then it can be no

odds

Having run into length, I ſhall only add at preſent, that I know ſeveral hundred acres which I remember to have been rented at 1s. per acre per annum;

odds to I where thou'ſt go." And ſo left the gentleman without telling him the road to Frog-hole, making a merit of his forbearance in not ſtoning him for a bailiff, an exciſeman, or a ſpy; whereas, if the ſtranger had ſatisfied the impertinent curioſity of Hodge with ruſtick good-humour, he would have carried him through the waters on his back, if it had been a mile, for ſix-pence.

The labouring people amongſt us are exceedingly ignorant; as a proof, the miniſter of Pawlet, at the time of the American war, choſe for his text theſe words: "Who will go up with me to Ramoath-Gilead to battle?" After a ſhort pauſe, and no perſon anſwering, one of our fiſhermen who had been a ſailor ſtood forward, and told the clergyman though none of the reſt would go with him, yet he would go.

A popular character may (if proof againſt the ague) live very comfortably and ſafe from free-booters in this country. The neceſſary qualifications are, riches, ignorance, and good-humour: one of this ſtamp, lately deceaſed, was more popular than any other, owing chiefly to a very trifling accident. The clergyman and he having drunk freely one ſummer evening at the publick-houſe, were returning home about twelve o'clock at night, when the parſon had the misfortune to be ſet faſt in a bog; and as men drowning will catch at a reed, ſo he petitioned his companion, very pathetically, for aſſiſtance. Our hero knew he was unable to afford his diſtreſſed friend any kind of relief, and told him ſo; but being overcome with his rhetorick, told him that it ſhould never be ſaid he had deſerted him, and ſo coolly walked into the bog, and ſat down by his ſide till morning, when they were both found and relieved. This gentleman's poultry were ſafe ever after, and what is more remarkable, his hedges eſcaped unmoleſted on the fifth of November.

The method of feeling a new parſon, as uſually phraſed, is to call him up at twelve o'clock at night to baptize a child; if he goes voluntarily annum; I remember the ſame lands ſold in fee at 20s. per acre; a[illegible] I know them at preſent to be worth 40s. per acre per annum. I know thouſands of acres improved to double and treble their value, and the inhabitants of Burnham alone are forty

voluntarily and with much ſeeming good-humour, his character is eſtabliſhed, and he is never more diſturbed: but if he ſhould happen to grumble, he is plagued into a compliance. However, the Rev. Mr. Diaper, of Eaſt-Brent, actually refuſed—the child died, not without ſuſpicion of foul play—law enſued, and the parſon wrote a very ſevere and violent ſatire, on Brent, printed, if I remember right, in the London Magazine, about the year 1738; I believe it may be read, with ſome alterations, in Dr. Bowden's Poems. I could repeat the verſes when a boy, and recollect one at preſent:

"The bleak knoll, and all the marſhes round,
"A ſort of chaos and unfaſhion'd ground;
"'Twere made in winter we may ſafely ſwear,
"For winter is the only ſeaſon here."

Mr. Diaper barely eſcaped with the ſkin of his teeth, but his Poem tended greatly to enrich the inhabitants of this country, by keeping out all ſtrangers, and keeping the price of land low. The judicious have allowed this poem to be a perſuaſive to the lords for diſmembering their manors;—a lucky circumſtance for the leſſees, who became the chief purchaſers, and whoſe deſcendants now live comfortably upon their own freeholds.

I could ſay much about wrecks. The laſt we had was on a Sunday, in time of Divine ſervice, when every living ſoul deſerted the parſon, except myſelf and the clerk who had but one leg. However, if I were to write the hiſtory of this, or any other wreck, I might ſtand a good chance "*to go to wreck*" myſelf. It will therefore be moſt adviſeable to be ſilent on a ſubject that, if divulged, would give offence to our neighbours.

thouſand pounds richer than they were forty years ſince, which I attribute chiefly [illegible] the improvements made on their lands. The practical method of theſe improvements ſhall be the ſubject of another letter. At preſent I have only to add, that I am with much reſpect,

Your obliged and cordial friend,

R. LOCKE.

ARTICLE XIII.

On the Improvement of Meadow Land.

[By the Same.]

Burnham, 16*th Feb*. 1789.

DEAR SIR,

THE neceſſity of keeping meadow in a good degree of culture muſt appear exceedingly obvious to farmers of every deſcription, but more particularly ſo to all owners and occupiers of *Dairy farms*, with which the flat part of Somerſet I have been treating of more eſpecially abounds. One-third part of theſe farms muſt be mowed every year, in order to ſupply the cows with winter fodder; this conſtant mowing cannot but have a tendency to impoveriſh ſuch lands, unleſs ſome proper methods are made uſe of to recruit its ſtrength, and conſtantly keep it in ſuch a due and regular ſtate as to make the meadows produce the greateſt quantity of graſs they are capable of. Having ſtudied this ſubject for theſe forty years paſt, I ſhall confine myſelf within my own practice, without paying attention to others; but herein I find great difficulty, being unavoidably obliged to ſpeak in the firſt perſon, a taſk very diſagreeable to farmers of a contracted education.

My grandfather died in 1748, when my father entered upon a dairy farm of about 200l. per annum. Part of this farm was ſeven acres and a half of meadow, then valued at 5l. per annum, having round its borders very high banks,* which had never been taken away from the time of its firſt being incloſed, and the middle of the field lay very low and wet. I adviſed the banks ſhould be removed to the depth of ſix inches below the ſurface, ſloping towards the ditches, and carried over the land, ſo as to make it entirely level, or, if any difference, higheſt in the middle of the field, which buried it in ſome parts to the depth of eighteen

* Banks here, and in all other places of this letter, mean nuiſances, as being compoſed of the earth and clay thrown up out of the rhines and ditches which embound the fields and incloſures of this flat country.

inches. It bore a good crop of horſe-beans where covered deep, and on the bord[illegible] and ſuch parts as had very little earth thrown over it, blue marrow peas were planted with good ſucceſs, and plenty of white clover ſeed ſown all over the field. This finiſhed the buſineſs at the expence of twenty pounds, excluſive of the ſurplus value of the corn exceeding the 5l. for rent. The ſecond year it bore a bad crop of graſs, which was, however, worth more than 5l. the old rent. The third year it was ſomething better; and by the fourth year it had a good ſound turf, ſo that the fifth year it was compleatly guttered; and by ſummer-feeding, in a few years, it became rich paſture land, without the aſſiſtance of a ſingle load of dung or compoſt of any kind. It gradually increaſed in value till lett to a tenant for 15l. per annum, and has continued at that rent to the preſent time.

One cloſe of eight acres belonging to this farm had been dug over in pits and pools, to repair the ſea-wall, and ſo exceedingly bad and irregular that it was thought incapable of improvement. It was therefore let to a tenant for five years, at 4l. per annum. At the end of this term, during which 20l. being expended with ſucceſs about the former cloſe, operated as a powerful motive to attempt doing ſomething to theſe eight acres: forty pounds were accordingly laid out in draining and levelling, by which ſimple method of improvement it ſoon became worth 15l. per annum, and was laſt year ſold cheap by my ſiſter's huſband for 360l.

Four acres of this land were let at 40s. per ann. but being ſo exceedingly poor the tenant refuſed to continue the poſſeſſion, unleſs the rent was abated to 1l. per annum. This was inſufficient to keep fences and pay taxes, which amounted to more than 20s. a year upon an average for forty years together. Here, then, was a cloſe worth nothing, nay worſe than nothing, for when it was left open to the common it had ſtill taxes to pay. I had in early life travelled through Cornwall, and ſomewhere upon the ſouthern coaſt in my road to Penzance obſerved the people buſily employed in cultivating the land with ſea ſand.* This I recollected, and as the cloſe lay within half a mile of the ſea-ſhore, an experiment was tried ſufficient to prove that perſeverance would have been attended with amazing ſucceſs; but having ſuch mountains of dry ſand upon the coaſt to paſs over before we can

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* Since I wrote the above I am informed by a gentleman from Cornwall, that the farmers of that county are ſo well acquainted with the good effects of ſea ſand as a rich manure, that it is taken in barges up the rivers as far as they are navigable, and afterwards carried on horſeback ten or more miles before it is thrown over the land.

get upon the beach, it is morally impoſſible, in its preſent ſtate, to haul it up. However, I am ſo fully convinced of the excellency of ſea ſand as a manure for clay lands, that had I but one acre adjoining the ſea, I would make a road through it, though it ſhould coſt me one hundred pounds. By ſea ſand, you will obſerve I mean the ſand upon our extenſive ſhore* which is daily overflowed by the tide,
by

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* The mouth of the river Parret is near a mile over, in which was an iſland of about eighty acres, called in the old maps Dunbal Iſland, having a large river on the weſt, and a ſmall river on the eaſt, in each of which the veſſels paſſed and repaſſed. It happened in the hard froſt anno 1739, that the ſmall river was filled with ſuch vaſt quantities of ice that it turned the current into the large river; and before the ice melted it was ſo much covered with ſlub and ſlime as to prevent the low water from paſſing, and is at this time nearly level with the land, inſomuch that our youth pay very little regard to the teſtimony of their fathers, when informed by them that they have ſeen ſhips ſail on the ſpot which is at preſent good paſture land.

Since my remembrance another iſland is formed near a mile in length, having at preſent much graſs upon it, and which I believe will in a few years be united with the former. Not far from the north end of this laſt iſland the great river was ſeparated into three ſmall ones; the firſt divided Burnham and Berrow Strand from a large track of ſand called the Gore; the ſecond divided the Gore from a leſs quantity of ſand, called the Lark-ſands; and the third divided the Lark-ſands from the Start-Point. This laſt is almoſt filled with ſand and ſlub: the ſecond river is widened, and is now the only one in which ſhips paſs; for the firſt river is ſo much ſtopped up, that the Gore-ſands are now united with Burnham and Berrow-Point, and our fiſhermen inform me, that, with the aſſiſtance of their ſlime-carts, they can go near ten miles ſtrait weſt into St. George's Channel at dead low water, when the tide is run out the loweſt poſſible.

Query,

by which means it is ſaturated with ſtrong ſalts of an alkaline nature, and ſhould therefore be thrown over the land immediately whilſt wet; for if permitted to dry, the ſaline particles with which this ſand is impregnated by the ſea water, will evaporate, and conſequently the ſand loſe the chief ingredient in its compoſition. Being diſappointed in the article of ſea ſand, the four acres of land were levelled upon the former plan; and ſoon after about 150 load of 30 cwt. each of dry ſand and dung, well mixed and turned, were dſread over it, and this made ſuch an effectual improvement, that it was very ſoon let to a tenant for twenty-one years, at 5l. per annum, neat, clear of all diſburſements whatever. The term was expired three years ſince, and I have now let it at 6l. per annum, but it is worth more.

In the year 1753 one Mr. Mapſtone, a gentleman from London, waited on my father at Iſleport farm, offering to ſell him 120 acres of land in Burnham, called the Henley Eſtate. My father declined the

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Query, Who is the philanthropic Captain, or rather Maſter, of one of the Bridgewater or other traders, that will be prevailed upon to publiſh a full and true deſcription of this Channel, in order to prevent ſtrangers from ſuffering ſhipwreck on this large and extenſive tract of flat ſand, the dread ſcourge of the unfortunate in the hands of pillagers on an inhoſpitable coaſt!

propoſal; I was not of age, but I pointed out to my mother's brother the advantages that would ariſe from cloſing in with this offer, in ſuch perſuaſive terms, that after much deliberation he was prevailed on to become a purchaſer at 1600l. The eſtate then let at 80l. per annum, but did not clear quite 50l. upon an average. Here was a large field open for induſtry, and my uncle proſecuted it to ſuch good effect, according to examples I have already laid down, that in a very few years this farm was increaſed to treble its value when purchaſed, and is at preſent worth, if it was to be ſold, upwards of 5000l.

In the year 1757 I purchaſed a farm of Marſh Dickenſon, eſq; then Lord-Mayor of London, which had for years been offered for ſale, and which every perſon was either unable or unwilling to buy. Part of this land conſiſted of ſix acres in one cloſe ſo exceeding poor that I was glad to let it by itſelf at 40s. per annum. This however did not laſt long, for I added to my former method of hauling the banks into the low parts to make it plain and dry, ſeveral good dreſſings with rotten dung and good bank earth, mixed into a compoſt by two turnings, and this did the buſineſs; for I immediately let it to a tenant for a term of fourteen years, at 10l. per annum. The term hath been expired for many years, and I have ſince added it to a farm, but it is worth at preſent 12l. per annum.

I have made other improvements and experiments upon meadow land that have come very near to, but none that have exceeded, thoſe already related. One thing I think worth remarking, viz. in the year 1759 I was ſolicited to purchaſe ſixty-one acres of land in Burnham at 200l.; and this eſtate hath ſince been ſo much improved, that I would now be glad to contract for the fee of it at 2000l. Indeed, ſince this time, various eſtates, to the amount of a great many hundreds per annum, have been purchaſed of perſons at a diſtance, by the inhabitants of Burnham, who have improved them much after the ſame manner, and who at preſent live very comfortably upon them.

As one great proof of the advantages ariſing from this mode of improving eſtates, the inhabitants of Burnham are at preſent owners of upwards of 1000l. per annum in other pariſhes, although I remember when no man in the pariſh (my grandfather excepted) was worth 1000l.— There were then but five jurors and freeholders in it, whereas at preſent we have fifteen returned to the county ſeſſions as gentlemen, thereby qualifying them to ſerve on the grand inqueſt of Somerſetſhire;

ſhire; and are worth from 2000l. to 10,000l. a man. We have, excluſive of the above, fourteen other farmers with eſtates ſufficient to qualify them as jurors to ſerve upon Niſi-prius juries; and have in the whole thirty-ſix freeholders, beſides ſix widow women farmers, worth 1000l. each upon an average.

You are not to ſuppoſe that no other pariſh beſides Burnham hath received benefit from this mode of huſbandry, viz. firſt making the land entirely plain and level; and ſecondly, keeping it perfectly dry by guttering; for the whole flat country I deſcribed in my laſt letter feels its good effects, more or leſs; but judging from the new-acquired riches of the inhabitants in general, I conclude no other pariſh hath, in the ſame number of years, exceeded, if equalled, the place of my nativity. However, I will here take the opportunity of introducing a few hundred acres lying in the pariſh of Mere, a great part of which I remember about forty years ſince was rented by a capital farmer and judicious grazier called Eſgar, at 1s. per acre; and ſome other parts were rented by ſundry other farmers, from 2s. to 5s. per acre. Mr. Eſgar purchaſed a large tract of this land in fee ſimple, and, according to the report of the day, *at twenty ſhillings per acre.* He immediately began to exert himſelf in making this land lye plain and dry, his neighbours followed his example, and without the aſſiſtance of any aſhes, dung, ſoil, or compoſt of any kind whatever, part of theſe lands have been ſold at about 40l. per acre; and many hundreds per annum, the remainder, are at preſent worth 40s. per acre per annum, and now owned and occupied by Edward Brown and Arthur Phippen, eſqrs. and ſeveral others.

I have hitherto treated of the improvement of meadow land, as it ought to be practiſed by the owners; the expence of which, together with the temporary loſs of the herbage, being too much to be ſuffered by the tenant. I ſhall now proceed to treat of the improvement of meadow land in the way it might be performed by tenants at will, or occupiers of land, independent of any expectation of ownerſhip, or certainty of continuing the poſſeſſion, ſuppoſing the landlord cannot be prevailed on to contribute towards the expence. In ſpeaking to this part of my ſubject, I ſhall beg leave to ſtate the methods I have practiſed myſelf in improving ſuch meadow lands as I have formerly rented.

Let, for example, the piece be two meads o five acres each, without any diviſion, having hig banks all round and loweſt in the middle. I tak poſſeſſion at *Lady-Day*, and immediately divide th

cloſ

cloſe into four equal parts, by cutting two croſs gutters quite through into the ditch. Let theſe gutters be eighteen inches deep and only ten inches wide, the wages is one penny per rope (of twenty feet) for cutting, and one penny per rope for ſpreading about the earth, making it fine, and getting it into the ground; the whole, being ſixty-three ropes, will amount to half-a-guinea; and this is all the expence the firſt year, for I indulge my workmen or ſome other labourers (enough of whom are always to be found) with the privilege of planting potatoes in ſo much of the bank in each quarter as I gueſs will amount to fifty put-loads, making in the whole two hundred loads. Theſe potatoes I order to be taken up about *Michaelmas*, or ſooner if I want to ſtock the field; and that the potatoe labourer may dig the bank quite to the bottom, and throw it round together in a high narrow ridge, I give him one ſhilling a quarter, that is, four ſhillings for the whole. If I want to mow the field the ſecond year, I then carry out theſe four potatoe-banks in the froſt; but if I do not want to mow the field, I prefer the covering it in the month of May to any other ſeaſon of the year. The bill for doing this will ſtand thus:

	£.	s.	d.
To hauling 200 loads of bank-earth, ten days, at 1s. 6d. per day - - - - - - - - -	0	15	0
To the hire of a put and one horſe, ditto, at 2s. 6d. per day - - - - - - - - - - -	1	5	0

	£.	s.	d.
To ſpreading about the earth, and beating it ſmall, ten days, [illegible] 1s. 6d. - - - - - -	0	15	0
To hauling the earth-drag* over it twice, two days' work - - - - - - - - - - -	0	4	0
To the potatoe labourer for turning and meliorating the bank - - - - - - - -	0	4	0
	£.3	3	0

Let this ten acres be thus dreſſed every ſecond year till all the banks are carried over the field; and whether it be ſooner or later, we can but add in the mean time one guinea and a half a year to the rent; and the only queſtion for the tenant's conſideration will then be, whether the ten acres have produced a ton of hay per annum extraordinary on account of any one or more of thoſe dreſſings; if ſo, the tenant is fully paid; but if it has not, there muſt be ſome fault in performing the labour.—However, if it ſhould have produced from one to ten tons a year, in addition to the uſual crop, on account of theſe repeated dreſſings, it will be an ample profit for the tenant, abſtracted from the advantage ariſing to the landlord in improving the fee.

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* Theſe drags ought to be made after the following manner:—Take five pieces of elm, aſh, or any other timber, ſeven feet long, and ſawed to ſuch a ſcantling that each end may alike form a ſcalenum triangle, whoſe longeſt ſide is nine inches, ſhorteſt ſide five inches, and middle ſide ſeven inches. Let theſe five pieces be framed together with five ſtrong oak rails, each ſeven feet long, in the manner of a harrow. This new implement now becomes an earth-drag, ſeven feet ſquare If the earth be mellow, haul that ſide forward which has the greateſt bevel, and this ſide will ſlide the lighteſt. If the clods be large and rough, haul the ſide forward that has the leaſt bevel. If the earth be almoſt ſmall enough, turn the drag upſide down, and haul the roundeſt edge forward; but if this drag be wanted to plain the land for mowing, haul the keen edge forward, always remembering to keep the wearing places well plated with flat hogſhead hoop iron. It ſhould be obſerved, that a great farmer ought to have three of theſe drags, one of ſix feet ſquare made light, one of ſeven feet ſquare above deſcribed, and one of eight feet ſquare made ſtrong with pieces of a larger ſcantling.

When all the bank-earth is compleatly finiſhed carrying about the land, I then, and not till then, proceed to gutter this field all over, beginning exactly thirty-three feet from the ſtraiteſt ſide, and ſo let each gutter be thirty-three feet from the other, till the whole is finiſhed. I uſually have but one draught gutter, and am always directed in a wet ſeaſon by the height of the water where to fix it; but it very ſeldom makes any difference in this level country, and in that caſe I prefer the middle of the field. The reaſon why I am ſo particular with regard to the exact diſtance of thirty-three feet, is, becauſe it is half a chain, and is fully ſufficient for a row or parcel of green hay; beſides, I can form a judgment as to the quantity of labour performed, according to the length of the field; for if it be five chains long, the plot between the gutters will be one rood; but if ten chains long, then half an acre, and ſo in proportion. Formerly theſe gutters were dug twenty inches wide, and but one foot deep; this was a bad method, for to ſay nothing of the great loſs of land, the cattle were continually treading down the edge of the gutter and filling it; whereas, if the gutter be twenty inches deep and but ten inches wide, the land will ſwell and preſs itſelf almoſt together on the top, ſo that the cattle may eaſily paſs over the gutter, which will continue its breadth at the bottom, and thereby ſtand many years, and anſwer the purpoſes for which it was intended.

By the time the whole of the old banks are carried over the land, the digging of the ditches in a ten-acre field will always produce a ſufficient bank for dreſſing, and if it ſhould not, the digging up the old gutters will ſupply the deficiency. This example will apply to all kind of wet meadow lands, with high banks; but where there are no banks about the fields, I have recourſe to the making of compoſt manure upon the corners of the commons and lanes neareſt the land I intend to improve.

In a journey to London, anno 1758, I obſerved upon a ſign in the road theſe words: "Peat-aſhes ſold here." The meaning of this I could not comprehend,

prehend, having always hitherto looked upon our peat-aſhes to be of no value [illegible] therefore made every neceſſary enquiry, and ſoon after my return home built a place to keep peat-aſhes dry, and in May or June I had them ſown over ſome poor land, after the rate of four put-loads to an acre, and I ſuppoſe in the courſe of a week it could be diſcovered to an inch how far they were ſown: nay, I have made one piece of three acres ſo rich by this method, that I will defy the moſt ſkilful agriculturiſt to make it richer. Farmers who keep large fires, and burn nothing but peat, (for there is very little beſide burnt in this country) will ſoon have a quantity ſufficient to try an experiment. With regard to a great variety of manures recommended by writers on agriculture, however good in theory, they cannot be of much utility in point of practice. Lime with us is 20s. a load, and of no uſe to meadow land, unleſs mixed with ſand or peat-aſhes. Soaper's aſhes is a tried manure, but we have no ſoap-boiler between Axbridge, Glaſtonbury, Bridgewater and the ſea, a circuit of fifty miles. Wood aſhes, however valuable as a manure, is worth from 1s. to 1s. 6d. per buſhel for another uſe. Indeed, the mentioning of ſoot, ſalt, rags, leather, ſaw-duſt, malt-duſt, fiſh-ſhells, bones powdered, and articles of like kind, as uſeful manure, (except in large towns and cities) appears as an impoſition on our underſtanding. It is true, peat-aſhes kept dry is an excellent manure, yet although *I have turbary of my own ſufficient to produce* twenty waggon-loads of turf in a year, I have never been able to enrich more than ſix acres of land with this manure ſince I have kept a farm.

I would not be underſtood to mean, that meadow land thus improved cannot be reduced to its original ſtate of poverty, for I know to the contrary, having tried an experiment upon twelve acres of meadow which have been in my occupation between thirty and forty years. The original rent was 9l. per annum; and having a leaſe upon it, I improved it in the manner here ſtated, till it produced me a ton and a half, and ſome years two tons of hay an acre. The rent was then raiſed to 18l. per annum, when I immediately began to work it backwards by mowing it every year (ſometimes very late) and hauling off the hay, letting the gutters fill, and the banks and ant-hills increaſe, ſo that half a ton an acre is not reckoned in its preſent ſtate a bad crop; the rent muſt therefore, in a few years, be abated to 9l. a year as formerly.

I beg leave to ſuggeſt an obſervation in this place that is worthy the attention of the agriculturiſt, as applied to this country; it is to make uſe of every proper method to get meadow land covered with graſs as early as poſſible in the ſpring; for if ſo, the abundance of dews which fall at that ſeaſon of the year upon the leaves of the graſs, will be conveyed through the veſſels to the roots, and the ſun's rays promoting the motion of the juices, will contribute to make it vegetate, even if we ſhould have a ſcarcity of rain; whereas if the land be fed bare in April and May, the increaſing heat of the ſun will exhale the circulating juices from the roots of the ſhort graſs upon barren land, ſo as to dry them up, and cauſe them to ſtagnate for want of moiſture; from hence I conclude, that if the meadow be covered over in the froſt, and the earth well huſbanded ſo as to nouriſh the tender roots of the graſs, it will cauſe it to vegetate ſo much the earlier in the ſpring, as to cover the ground before the ſun's rays can act ſo powerfully as to ſcorch it up; in which caſe it will in a dry ſummer grow double the quantity of hay it would have had on it without ſuch dreſſing. However, landlords ſhould dreſs their lands in the ſummer as already recommended.

I do not in general like the rolling of meadow, our heavy clay ſoil being cloſe enough without it; beſides, the roller will preſs the looſe clods of earth *into the land, where it will lie like a ſtone; but if* it had been permitted to remain on the top of the ſward, the ſun, wind, and rain, would have meliorated the lumps ſo as to ſlait abroad like a limeſtone; and being thus divided into ſmall particles, it would of its own accord (at leaſt aſſiſted by the earth-drag) incorporate with the land, and promote vegetation. However, if a cloſe of meadow hath been much trod by cattle, it certainly ought to be rolled, (if but for the reaſon of cloſe mowing and feeding) but it ſhould be done at a particular point of time; for it is poſſible in the morning it may be ſo wet as to clog the roller, and the land may become preſſed into pits; yet a twelve-hours hard dry March wind, aſſiſted by a ſcorching May ſun, will make the land ſo ſtiff that it muſt be a heavy roller to make it ſmooth.

When meadow land abounds with moſs, as is ſometimes the caſe, and the farmer hath no opportunity to tread it well with cattle by feeding them upon it in the winter or ſpring, I then recommend the ſpike-roller as the beſt method of deſtroying it next to ſuch treading; but in this caſe there ought to be ſown ſome white clover or other graſs-ſeeds about the field; if in ſmall rain, the better it will be beaten into the pits made by the roller;

but whoſoever will uſe the ſpike-roller ſhould feed all their houſe-cattle upon ſtrong wires with drawers underneath to catch the ſeeds, which ſhould be ſown over the meadows againſt rain, in preference to clover or any other ſeed. I have had ſome thoughts of watering the meadows thus rolled with barton drainings and thick water, by a water-cart of a new conſtruction, in ſomewhat the ſame manner as the ſtreets of London are watered; but having let my farm to a tenant, I ſhall not now make the experiment.

Whoever will take the trouble to number the different ſorts of plants and graſs growing in one of our meadows, will find them to be from one hundred to one hundred and fifty. I can find names for, and inveſtigate the properties of ſome of theſe; but as I cannot of all, I am content to be ſilent on that ſubject, lamenting that I have been ſo circumſtanced in life as never to have had an opportunity to ſit a month at the feet of Linnæus, or any other able botaniſt. However, I mean to tranſplant theſe into ſo many different pans filled with the ſame ſoil and buried in my garden, in order to obſerve, from time to time, the different qualities of the different plants, in all the different ſtages of their growth.

I apprehend that the mode of improving meadow land, as here laid down, will equally apply to the *fens of Cambridgeſhire, the flat part of Lincolnſhire*, and the low meadows bordering upon the Thames, the Trent, and ſome other great rivers. I have travelled in thoſe counties, and obſerved their method of huſbandry to differ greatly from what I have practiſed with good ſucceſs, for in general they dig their gutters crooked and without any order. I have expreſſed my ſentiments very freely to ſome of the farmers in Lincolnſhire, Nottinghamſhire, Leiceſterſhire, and ſome other counties, who will not be perſuaded but their beſt lands exceed in richneſs thoſe of the Northern and Weſtern parts of England; yet I do not recollect any large farms in the Eaſtern counties, which lie at a diſtance from market-towns, that exceed 30s. an acre per annum upon an average; whereas our farmers can well afford to pay 40s. an acre, ſtatute meaſure, for all thoſe lands that are brought into the higheſt degree of culture; and ſeveral thouſand acres in this county are now let at 50s. per acre, landlord paying all diſburſements.

Some years ſince I let a farm to a poor man, who deſired an account of his profit and loſs might be kept by his neighbour, Mr. John Adams, who, about ſeven o'clock in the evening of the 19th of

Auguſt 1784, was robbed and murdered by two footpads, being ſhot through the body. The memorandum found amongſt his papers is in ſubſtance as follows:

" 25 March, 1771, Robert Hardwidge rented of Mr. Locke, Gooſemore-farm, being fifty-ſix acres, at 91l. per annum. Tenant had two cows of his own, and rented fourteen cows of his landlord at 14l. per annum.

Caſh, Debtor.

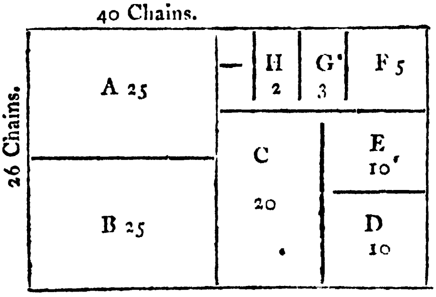
	£.	s.	d.
To rent of the farm - - - -	91	0	0
To the hire of fourteen cows - -	14	0	0
To ten pigs bought poor - - -	10	0	0
To houſe-keeping for two, excluſive of the farm beverage - - -	8	0	0
To caſh in houſe - - - - -	40	0	0
	£.163	0	0

Per Contra, Creditor.

	£.	s.	d.
By 56 cwt. of cheeſe, at 1l. 12s. 6d.	91	0	0
By ſixteen calves ſold - - - -	16	0	0
By the whole year's butter - - -	16	0	0
By ten pigs ſold fat - - - - -	26	0	0
By wintering forty ewes - - -	14	0	0
	£.163	0	0

The tenant was twelve years upon this farm; the firſt five he acquired 250l. at the end of which he became a convert to Mr. Madan's doctrine of polygamy, and ſpent in ſeven years his whole property.

I lay it down as a rule, that a Dairy-farm of 200l. per annum ought to keep thirty-two cows, four heifer yearlings, four two-years-old heifers, two carting brood mares with two ſucking colts, two yearling colts, two fat oxen, and ſixty ewes, at winter. I know a farm of this kind that adjoins a turnpike-road, and conſiſts of a manſion, garden, and neceſſary out-buildings, with about an acre of orchard, which commonly makes in good years twenty hogſheads of cyder, and one hundred acres, ſtatute meaſure, of excellent rich land, laid out as follows:



	Acres.
A. Higher Ham Paſture - -	25
B. Lower Ham Paſture - -	25
C. Long Mead -	20
D. Lower Mead -	10
E. Higher Mead -	10
F. Oxen Ham –	5
G. Calves Cloſe –	3
H. Horſe Paddock -	2
	100

Landlord to pay all taxes, repair the buildings and outbounds, and keep fenced the fir-trees and hedges round the farm. Tenant to dig the infences, pay the tithe, repair the highways, and keep the farm in a good ſtate of culture.

One year's account of the tenant upon this farm is ſtated thus:

Caſh, Debtor.

	£.	s.	d.
To one year's rent - - - -	200	0	0
To houſe-keeping for ſix, excluſive of the produce of the farm - - - -	20	0	0
To wages to two men and two maid-ſervants	20	0	0
To two oxen, bought for the plow and grazing	18	0	0
To ſixteen pigs, bought poor - - -	16	0	0
To wear and tear of dairy-utenſils, and expences about ditto - - -	8	0	0
To ditto of goods and farming utenſils -	8	0	0
To tithes, at 1s. per acre - - -	5	0	0
To clothes, and other neceſſaries - -	8	0	0
To caſh in houſe - - - -	100	0	0
	£.400	0	0

Per Contra, Creditor.

	£.	s.	d.
By 112 cwt. cheeſe (being 3½ cwt. each cow) at 1l. 16s. per cwt. - - - - -	199	12	0
By the whole year's butter (kept by itſelf)	30	0	0
By 28 calves ſold (4 of the beſt preſerved to breed)	28	0	0
By 8 pigs, ſold fat (the other 8 killed in houſe)	24	0	0
By bacon ſold - - - - -	7	8	0
By 2 oxen, ſold fat - - - -	26	0	0
By 4 cows, ſold fat (ſucceeded by 4 heifers)	24	0	0
By 2 coaching colts, 2 years old (ſucceeded by 2 yearlings) - - - - -	40	0	0
By wintering 60 ewes - - - -	21	0	0
	£.400	0	0

Turkeys, geeſe, ducks, and other poultry,
in lieu of pin-money.

As this is a Dairy farm without any tillage, the tenant, with two able-bodied men ſervants, are quite ſufficient to manage the buſineſs of it in all its branches.

The only probable objection that can be raiſed againſt this account, will be founded on a doubt whether $3\frac{1}{2}$ cwt. of cheeſe at 1l. 16s. per cwt. may not be too much for an average quantity per cow, and price per cwt. In anſwer to which, if the Bath Agriculture Society ſhould think proper to offer any trifling premium in order to diſcover the fact, I could produce one Jacob Ameſbury, a dairy farmer, now living at Bleadon in the county of Somerſet, who from twenty cows, ſummer fed on twenty-five acres of rich land, made 90 cwt. of cheeſe the year paſt, which cheeſe was ſold to a Mr. Carter, factor, in Briſtol, at 2l. 4s. per cwt. and one guinea over, amounting together to the ſum of 199l. 1s. which is near 10l. per cow, upon an average, for cheeſe only.

I will very readily anſwer any queſtions by way of explaining any thing doubtful, either in this or my former letter deſcriptive of the flat part of Somerſetſhire.

I am, dear Sir, your moſt obedient

And obliged humble ſervant,

R. LOCKE.

ARTICLE XIV.

On the Uſe of Plaiſter of Paris as a Manure.

[By J. KIRKPATRICK, eſq; to the Secretary.]

St. Croſs, Iſle of Wight, Dec. 2, 1789.

SIR,

I Have not had the pleaſure to addreſs myſelf to you for ſome time. It was my intention before this (agreeably to the deſire of the Society) to have collected ſome particulars of the agriculture of this iſland, but my ill ſtate of health prevented me; and for which, being adviſed to take a voyage at ſea, curioſity led me to viſit the United States of America; great part of the Northern provinces, and Canada, I have therefore travelled through this ſummer; and, among other objects which engaged my attention, agriculture was not forgotten. The letter, of which you have a copy incloſed, I met with at Philadelphia; the ſubject ſtruck me at the time of reading it as worthy of attention, and more ſo after I had ſeen ſome land on which the plan recommended had been tried. The cheapneſs and efficacy of the Plaiſter of Paris makes it much uſed in the States; and if, by the recommendation of the Society, any experiments are made, and it is found to anſwer the account given of it, I ſhall be happy in having been the means of furniſhing the Society with this account.

The only thing which makes me doubt its being brought into general uſe, is the price, which in this place is 8s. per buſhel, owing to the very high duty on that imported from France. At Philadelphia it is ſold, ready prepared for ſowing, at 5s. per buſhel, *their currency, which is* 7s. 6d. per dollar.

I have been informed, that large quantities of it are to be got in the neighbourhood of Liverpool, which I ſuppoſe would be free of the duty, and conſequently come much cheaper.

Wiſhing every poſſible ſucceſs to the Society,

I am, your moſt obedient ſervant,

JOSEPH KIRKPATRICK.

Extract of a Letter from a Gentleman in Pennſylvania, to Joſeph Kirkpatrick, eſq.

“ In anſwer to your queries reſpecting *Gypſom*, or *Plaiſter of Paris*, I ſhall give as full information as I can of the ſucceſs of my own and my neighbours' experiments.

"The beſt kind is imported from hills in the vicinity of Paris; it is brought down the Seine, and exported from Havre-de-Grace. I am informed there are large beds of it in the Bay of Fundy, ſome of which I have ſeen nearly as good as that from France; nevertheleſs, ſeveral cargoes brought from thence to Philadelphia have been uſed without effect. It is probable this was taken from the top of the ground, and by the influence of the ſun and atmoſphere diſpoſſeſſed of the qualities neceſſary for the purpoſes of vegetation. The lumps, compoſed of flat ſhining ſpecula, are preferred to thoſe which are formed of round particles like ſand; the ſimple method of finding out the quality is to pulverize ſome, and put it dry into an iron pot over the fire, when that which is good will ſoon boil, and great quantities of the fixed air eſcape by ebullition.

"It is pulverized by firſt putting it in a ſtamping-mill. The finer its pulverization the better, as it will thereby be more generally diffuſed.

"It is beſt to ſow it in a wet day. The moſt approved quantity for graſs is ſix buſhels per acre. No art is required in ſowing it, more than making the diſtribution as equal as poſſible on the ſward of graſs. It operates altogether as a top manure, and

therefore

therefore ſhould not be put on in the ſpring, until the principal froſts are over, and vegetation hath begun. The general time for ſowing with us is in April, May, June, July, Auguſt, and even as late as September. Its effects will generally appear in ten or fifteen days; after which the growth of the graſs will be ſo great as to produce a large burden at the end of ſix weeks after ſowing.

" It muſt be ſown on dry land, not ſubject to be overflown. I have ſown it on ſand, loam and clay, and it is difficult to ſay on which it has beſt anſwered, although the effect is ſooner viſible on ſand. It has been uſed as a manure in this State for upwards of twelve years. Its duration may, from the beſt information I can collect, be eſtimated from ſeven to twelve years; for, like other manure, its continuance very much depends on the nature of the ſoil on which it is placed.

" One of my neighbours ſowed ſome of his graſs ground ſix years ago; another four years ago; a great part of my own farm was ſown in May 1788. We regularly mow two crops, and paſture in autumn; no appearance of failure, the preſent crop being full as good as any preceding. I have this ſeaſon mowed fifty acres of red clover, timothy graſs, white clover, &c. which was plaiſtered laſt

May, July, and September; many who ſaw the graſs eſtimated the produce at two tons per acre, but I calculate the two crops at three tons. Several ſtrips were left in the different fields without plaiſter; theſe were in a meaſure unproductive, being ſcarce worth mowing.

"In April 1788, I covered a piece of graſs land upwards of two inches thick with barn manure; in the ſame worn-out field I ſowed plaiſter, to contraſt it with the dung. I mowed the dunged and plaiſtered land twice laſt year, and once this; in every crop the plaiſter has produced the moſt.

"You will remember, in all experiments with clover, to mix about one-third timothy graſs ſeed; it is of great advantage in ſerving as a ſupport for the clover; it very much facilitates the curing of clover, and when cured is a ſuperior fodder.

"The plaiſter operates equally as well on the other graſſes as on clover. Its effect is ſaid to be good on wheat, if ſown in the ſpring; but I cannot ſay this from experience. On Indian corn I know its operation to be great; we uſe it at the rate of a table-ſpoonful for a hill, put in immediately after dreſſing.

" From ſome accurate experiments, laſt year, made and reported to our Agricultural Society, it appears that nine buſhels of additional corn per acre were produced by this method of uſing plaiſter.

" As the uſe of this cheap and extraordinary manure has now become very general in this State, and many accurate and judicious farmers are now making experiments therewith, I doubt not but its uſes, at the cloſe of the ſeaſon, will be better known and further extended; when I ſhall be happy to make a communication thereof to you.

" I am, &c. &c."

ARTICLE XV.

An Account of an Experiment actually made to diſcover whether whole Potatoes or Cuttings are to be preferred in planting, &c.

[By Mr. JOSEPH WIMPEY.]

EARLY in the ſpring of this year I had a large quantity of potatoes, out of which I ſelected forty-eight buſhels of the faireſt for ſets. The ground intended for them, the ſummer before, had borne oats and vetches, which were mowed green, and given to the horſes in the ſtable; after which it was depaſtured till January. It was then clean ploughed, and lay till the end of March. Twenty-four cart-loads of long dung, forty buſhels to the load, were then ſpread over it equally. Furrows were then drawn the length way of the field, at a yard diſtance from each other. In eleven of theſe furrows, containing ſixty perch or pole, were dropped fourteen buſhels of whole or uncut potatoes, the ſize generally from a large pullet's egg to that of a gooſe. The remainder of the ground, being 265 poles, making in the whole 325 pole, or two ſtatute acres and five pole, was planted with thirty-four buſhels of cut potatoes, being the remainder of the forty-eight buſhels. Theſe were cut moſtly out of large potatoes, in pieces about the ſize of a large pullet's egg. The largeſt were cut into ſix or eight pieces, the leſſer into four; being careful to preſerve a proper number of eyes or buds in each cutting. The ſets of both cut and uncut were planted about fourteen inches aſunder, in the rows. The furrows were turned out with a plough having a double mould-board, which, when planted, were compleatly covered by running the ſame plough up the middle of each interval, which threw the mould half one way and half the other, and is the ſpeedieſt, eaſieſt, and cheapeſt method of planting I am acquainted with. *The ground was planted the 14th and 15th days of April laſt.*

In June they were *horſe-hoed with* a *ſmall* one-wheel plough, which I keep for horſe-hoeing; and this was all the labour and expence beſtowed upon them during their growth.

The 30th of October the taking of them up was compleated. The whole produce was only 378 buſhels;—a very indifferent crop! little more than half the acreable produce of laſt year. The expence of ploughing them up, harrowing, dragging, picking up, loading, carrying home about a quarter of a mile, unloading, and carrying into the barn, &c. was not quite 3d. a bag, or 1d. a buſhel. The ſtate of the account, in a comparative view, I make out as follows:

The meaſure of all the ground planted was 325 poles. The whole produce 378 buſhels. The meaſure of the ground planted with *cut* potatoes was 265 poles; the produce 312 buſhels. The ground planted with whole or *uncut* ſets was 60 pole, and the produce of the ſame 66 buſhels.

Now, if 325 poles, the whole meaſure of the ground planted, produced 3[illegible] buſhels, then 265 poles ſhould produce 308 buſhe[illegible] the fractions) but this quantity of ground plante[illegible] cut potatoes) produced four buſhels more [illegible] is, 312 buſhels. Again, as 325 poles produced 378 buſhels, then 60 poles ſhould have produced 69 buſhels [illegible]; but it produced only 66 buſhels, which is upwards of three buſhels ſhort of its proportion. It is true the difference is too trivial to be worthy of notice; but what it is, is in favour of the cut potatoes. With reſpect to the acreable produce, then, it is a matter of little importance whether the ground be planted with *cut* or *uncut* potatoes.

The acreable produce being nearly the ſame, whether planted with whole or cut potatoes, the great and intereſting comparative queſtion remains, viz. What is the difference of the expence in the planting of cut or uncut potatoes? which is very ſatisfactorily aſcertained as follows:

If 48 buſhels, the whole quantity of ſets uſed, produced 378 buſhels, then 34 buſhels, the quantity cut, ſhould produce 267 buſhels; but they produced 312, which is 45 buſhels more than the proportion. Again, If 48 buſhels produced 378 buſhels, then 14 buſhels ſhould have produced 110 buſhels; but 14 buſhels of uncut produced only 66 buſhels, which is 44 buſhels leſs than the proportion. A preference of 40 per cent. in favour of cut potatoes, in compariſon with whole ſets!

By this ſtatement it clearly appears, that any *quantity of land planted with potatoes cut into* pieces of the ſize above-mentioned, will, *cæteris paribus*, produce as great a crop as an equal quantity of land planted with *uncut* potatoes, the weight of which ſhould be 40 per cent. more: for example,

To plant a ſtatute acre with potatoes as above, would require of uncut 37⅓ buſhels; of cut only 20½ buſhels, the difference nearly 17 buſhels; which at 2s. 4d. per buſhel, the price they ſold at in March and April laſt, amounts to 1l. 19s. 8d. an object much too conſiderable to be neglected by the planter of many acres, even when the price may be as low as 3s. a ſack.

N.B. Potatoes in this county are uſually ſold by the bag. By a bag is underſtood a ſack which will hold four buſhels of corn, 9-gallon meaſure, which they fill as full as they can to admit of its being tied; and the uſual weight is 12 ſcore or 240lb. This ſack holds 3 buſhels of potatoes heaped.

The foregoing experiment was conducted with all imaginable care and preciſion, the facts are truly ſtated, and the writer hopes the calculations are juſt.

P. S. In claſs 3, article 4, a premium is offered to the inventor of the beſt new-conſtructed plough for ploughing up potatoe-crops, by which the work may be done with the leaſt loſs or damage to the crop. As my method of taking up potatoe-crops is not attended with the leaſt loſs or damage, and is, I conceive, as expeditious and as little expenſive as can be deſired, I requeſt leave to lay it before the Society.

As obſerved before, I plant my potatoes in rows with intervals of about three feet, for the convenience of horſe-hoeing them. When the haulm is decayed, I proceed to take them up in the following manner:—With a common foot or one-wheel plough, much uſed in this part of Hants, and in Wilts; the ploughman having *firſt taken out the coulter*, and adjuſted the wheel ſo as that the point of the ſhare may be deep enough to paſs under the bed of potatoes, he begins at one end juſt under the middle of a row, and with one furrow turns them out on the ſurface of the ground. Two or three boys or girls follow the plough, and pick them up as they appear; ſo that the ground of one row is *cleared before the ploughman has finiſhed another,* and thus they proceed without the leaſt hindrance or interruption to each other.

When the whole is ploughed and picked in this manner, a pair of drags is run over the whole, which ſeparates and expoſes the potatoes that may happen to adhere to the clods of earth, which are then alſo picked up and the grounds nearly cleared. The ſeaſon being now come for ſowing wheat, the ground is clean ploughed, and the few potatoes that may poſſibly remain fully expoſed to view, which being alſo picked, the ground is rendered very clean. —In this way the whole expence of harveſting the crop is little more than picking and carrying home; for the expence of ploughing, &c. is little, if any, more than would have been incurred in tilling the ground equally well for the wheat crop.

Now I think it impoſſible, by any invention or device whatever, to take up a potatoe-crop with leſs loſs or damage. The crop of the above experiment was taken up under my own eye, and I with great truth and confidence aver, that there were not ſo many as a ſingle gallon bruiſed, cut, or damaged in the leaſt degree whatever.

North-Beckhampton,
1789.

ARTICLE XVI.

On the Rotation of Crops;—the Advantage of Carrots as a Food for Cattle, &c.

Stiſted-Hall, near Braintree,
SIR, *Nov.* 25, 1788.

I Should be happy, by ſome agricultural communication, to acknowledge the honour of your application to me from the Bath Society: but, on ſo ſmall a ſcale of arable land as mine, kept more for family convenience than amuſement, where a regular courſe is followed, not an experiment tried, nor an improved inſtrument uſed; ſcarcely any thing but tireſome repetition can be ſent, or what is known by general experience, uſeleſsly confirmed. I have *twice* gone over on my *four* arable fields in the following rotation of crops, with only *one* plowing for each crop:—Oats, with rye-graſs, the graſs *ſprinkled* with dung and earth mixed in the winter, and *conſtantly* fed till the ſucceeding autumn; then wheat; next, the *ſmall* forward Spaniſh bean, planted in two rows, on four furrows, and *three* times hand-hoed; after theſe oats, &c. again. I am convinced with ſuch *hoeing*, *manure*, and *feeding*, this very ſimple courſe of crops may be followed as productive, for two rotations;

at the third, a fallow to me ſeems *eſſential,* in the room of the beans; as no *hand*-hoeing with us keeps the ſoil in ſufficient purity for any *longer* term, without a *compleat year*'s fallowing. On this fallow, in the next year, barley, as more valuable than oats, ſhould be ſown, with rye or any other graſs, clover, or trefoil; and then the old rotation, with *one* ploughing, come forward again. I am ſatisfied any fallow might be avoided, though I doubt whether with any equivalent advantage, if more ploughings were afforded towards throwing the wheat-ſtubble into ridges of four furrows, planting *two* rows of beans on *each* ridge, hand-hoeing theſe three times, the hoer always *walking in* the furrow, and drawing his weeds *there,* and then ploughing theſe furrows up again to the ridge, with a double-breaſted plough and one horſe. The imperfection of our hoeing, expenſive as it is, (for three times hoeing my beans come to 13s. per acre) ariſes, in ſome degree, from the labourer *following* his hoe, and at every ſtep treading in the weed it has removed; which muſt be the caſe in flat work, whether, at *only one ploughing,* the land be thrown into ſtetches, (beds) as with us, of eight, twelve, or ſixteen furrows. But on the *ridge* of *four* furrows, this notorious inconvenience is, as I have obſerved, avoided; the furrow is the path for the hoer and the place for the weeds; from which they are *again* diſplaced and prevented rooting at *every* hoeing, by the double-breaſted plough.

About an acre, in the above rotation, of my bean-field, I have applied, as a winter vegetable, to carrots. The product, with ſo little ploughing and no manure, has been, on an average, only about 400 buſhels per acre. I am however ſenſible they will amply repay every expence of the *fineſt* culture; and ſhould, from their extenſive utility, on ſound, deep, and friable land, be every where attempted. Mine, in general, is far from being their proper ſoil. I ſow in March, or April; hoe three times; harrow after each hoeing; have ſometimes left them in the land till after Chriſtmas, and taken them up as wanted; but lately have taken them up in October, in dry days, put them directly into ſmall *upright* cocks of ten buſhels each, *entirely* covered, with the tops cut off; they *thus* appear to dry better than in any other mode; and, with very little loſs, to bear the weather. If, after being thus dried, they are carried into any barn, or ſhed, it will be better, if in large quantities, through the hazard of heating, not to pack them *cloſe*, but rather throw them promiſcuouly into *heaps*, with a little ſtraw over them. Some of my neighbours, who have been induced by me to try them, *on a rather larger ſcale*, with *ſiner* culture, and *freſher* ſoil, have raiſed from ſix to nine hundred buſhels per acre, and applied them more profitably, as well as more generally, than any other winter herbage, to deer, ſheep, bullocks, cows, and horſes. At the loweſt calculation they are, from our little trials, eſteemed to exceed turnips in value one-third, as to quantity of feed; but are far ſuperior in what ariſes from convenience. For the ſtable, where to *us* they ſeem to be a perfect ſubſtitute of corn for all horſes, at leaſt not uſed in any quick work; and partially ſo, with corn, for thoſe that are.

The compariſon (tilths for each alike) betwixt the produce and value of an acre of oats, and one of carrots, one buſhel of the latter preſumed equal to one peck of the former; and each eſtimated at ſix-pence, will, I conjecture, ſtand thus:

One Acre of Oats, Dr.

	£.	s.	d.
Seed, four buſhels - - -	0	8	0
Mowing - - - -	0	2	0
	0	10	0

Per Contra, Cr.

Five quarters of oats, at 16s. per quarter, being 160 pecks, at 6d. per peck -	4	0	0
Deduct -	0	10	0
Net profit -	3	10	0

One Acre of Carrots, Dr.

	£.	s.	d.
Seed, eight pounds - - - - -	0	8	0
Hoeings thrice - - - - -	1	10	0
Harrowings - - - - - -	0	3	0
Digging up, gathering, and cocking, at 1d. per buſhel, 400 buſhels - -	1	13	4
	£.3	14	4

Per Contra, Cr.

	£.	s.	d.
400 buſhels of carrots, at 6d. per buſhel	10	0	0
Deduct -	3	14	4
Net profit -	6	5	8
Net profit oats -	3	10	0
Exceſs on carrots	£.2	15	8

When perfectly dry, no waſhing of the carrots is, in general, neceſſary for any cattle, except horſes *regularly* kept in the ſtable. This is undoubtedly a little additional trouble and expence. We ſow in March. If the weather continue dry, it will be ſome weeks before this plant appears, and ſo *very delicate*, as to make the firſt hoeing, or rather weeding, which muſt be as early as their ſtrength admits, extremely tedious and troubleſome. In about a fortnight their root will be ſufficiently fixed to bear harrowing, by which their growth will be promoted, and the land cleaned; and the treading of the horſes will not hurt the plants. In about a fortnight more the ſecond hoeing, to ſet them out at ſix inches ſquare, will follow, and a ſecond harrowing; the third, if at all neceſſary, juſt as the ſtate of the ſoil and growth of weeds may require; for as to the carrots, their nouriſhment is drawn from a bed ſo much deeper than that of weeds, as not to be at all injured in their progreſs, though diſgraced in their appearance, by ſuch company.

Such are my trivial attempts, on a few acres in agriculture:—To the adventurers in it, *on a large ſcale*, I look up with ſomewhat of veneration, as the beſt ſubjects of the ſtate, and the firſt friends of man; but which, in this kingdom, as the ſource of all *permanent* manufacture, and fair commerce, inſtead of receiving every political encouragement, is burthened with every oppreſſion that the ſpirit of monopoly can deviſe, the cunning of trade demand, and the intereſt of corruption ſupport; and conſequently the large capitals ſeduced into every ſpeculation and purſuit, except that which promiſes an ampler and ſurer, though ſlower return, and far more congenial with that habit of patient induſtry, and exact œconomy, to which alone wealth *ſhould* appertain,—*the perfect cultivation of our ſoil.*—A fourth, probably, of this Iſland is nearly waſte; wanting only an *encouraged* cultivation to afford employment and comfort to that numerous poor, which the manufacturer rears for the landholder, under a rate of two millions per annum to ſuſtain; and which remains a mark of more barbarous folly in this refined age of *arts*, *manufactures*, and *commerce*, than of tyranny in that groſs one, when feudal dignity demanded ſuch a range for its ſavage chace. What does that kingdom merit, that preſuming to take the lead in wiſdom amongſt the nations of the earth, yet, for want of the moſt obvious exertions of benevolence, in the *publick* encouragement of rural induſtry, ſpurns at the very means that Providence offers for its *peaceable* greatneſs—*at home*;—and madly thinks of gaining power and commerce, and *preſerving its freedom*, by ſquandering wealth and population in the acquirement of dominion—*abroad*;—thus placing itſelf in a ſtate of conſtant jealouſy and fear with one-half of the world, and counteracting the very advantages of that commerce it would thus violently enſure, by the enormous burthens, eſſential at all times to guard againſt, and frequently to ſupport, the wars reſulting neceſſarily from ſuch miſtaken policy?

I am, Sir,

Your obedient ſervant,

CHARLES ONLEY.

ARTICLE XVII.

An Enquiry concerning the Smut in Wheat. 1. Of its Cauſe. 2. Of the Means of preventing it. 3. Of its Remedy.

MANY are the *noſtrums* which are ſaid to be infallible in preventing or remedying this common evil; and many more are the pretenders to choice ſecrets, which are effectual, certainly, to the ſame moſt valuable purpoſe. But every practical farmer of common obſervation knows, aſſuredly, to his ſorrow, that in unſavourable ſeaſons none of the boaſted means he has uſed hath ever effectually anſwered his purpoſe.

The firſt ſtep towards the remedying any evil either in the animal or vegetable kingdom, is the true knowledge of its cauſe; without it, all is quackery, and too often the artifice of deſigning adventurers, who hope to make a ſiniſter advantage of the weak and credulous, who are too apt to ſwallow the hook which is covered with a gilded bait. Every one embraces with pleaſure what he is perſuaded will promote his intereſt.

The previous queſtion is, what is the *cauſe* which generally produces the ſmut in wheat?

To this no poſitive or probable anſwer has been given. It has been generally ſuppoſed, if one may judge by the means commonly uſed to prevent it, that it proceeds from the ſeed, whoſe *ſtamina*, by ſome means or other, have been vitiated; for all the means of prevention I ever heard of, were uſed in the preparation of the ſeed previous to its being ſowed.

The moſt common method is brining and liming the day before ſowing, which is done either with ſea-water, the brine of meat, or of ſea-ſalt diſſolved in water made ſtrong enough to bear an egg. To this, ſome whimſical people have capriciouſly added ſeveral ingredients, which are much more likely to deſtroy the vegetative principle of the ſeed, than to remedy any evil the rudiments of which might latently ſubſiſt in it. To this purpoſe, flour of brimſtone, aloes, copperas, and verdigreaſe in fine powder, aſſafœtida, and even arſenick, have been recommended to be infuſed in the pickle; but this is ſo very abſurd, and even dangerous, that men of ſober common ſenſe are both afraid and aſhamed of the practice.

The practice of brining and ſteeping was ſuggeſted by accident, eſtabliſhed by cuſtom, and continued againſt all reaſonable conviction of its utility. In unfavourable ſeaſons, every one knows, that ſmut generally prevails in ſpite of every precaution that has been *hitherto* taken. Brine, pickling, liming, change of ſeed, and ſeed of one year old and upwards, avail nothing. In cold wet ſummers the ſmut prevails, notwithſtanding the uſe of every means which invention hath urged, or ingenuity practiſed.

The circumſtances that firſt attracted my notice, and engaged my attention to this ſubject, were as follow:—Some years ſince I ſet a ridge with wheat, by way of experiment, in rows at various diſtances; in the courſe of the ſpring it was hoed two or three times, and was as healthy, vigorous, and fine, as ever was ſeen. In general it was from four to five feet and a half high, the ſtraw uncommonly large and ſtrong, and the ears from four to five inches and a half in length. No corn ever appeared more promiſing. Thus it continued till the bloom appeared, about the middle of June. The weather then became wet and cold, and frequently deprived the corn of what is uſually called its bloſſoms. Before the end of the month, the ears put on a ſickly look, and upon examination, it was found amazingly ſmutty; more ſo, indeed, than I had ever obſerved any before. In vain I examined the roots, the ſtraw, the joints, &c. all appeared ſound and perfect, till I came to the ear; there the evil began, but from what cauſe, or by what means, not the leaſt veſtige could be found.

As the plants were vigorous, perfectly healthy, and ſound, till the bloom appeared, and then turned ſickly and diſtempered, and at length immoderately ſmutty, it ſeemed very clearly to follow, that it could not be owing to any imperfection in the ſeed, but entirely to the inclemency of the air, which by ſome means or other infected the grain in its embryo-ſtate, and converted the milky ſubſtance, which conſtitutes the meal or flour of the corn, into a black, fœtid, unwholeſome powder, known by the name of ſmut.

Strongly impreſſed with this opinion, I determined to embrace every opportunity of gaining all poſſible information on the ſubject. For ſome two or three years the ſeaſons were favourable, and afforded no opportunity for obſervation; but 1787 was an unproſperous year, and gave us ſmutty wheat in abundance. Yet though I was very attentive to its progreſs after it was diſcovered, I gained no additional intelligence reſpecting the cauſe; but a full confirmation of my former opinion, that the ſmut was generally, if not totally, cauſed by the inclement and vitiating principles of the atmoſphere which happened at the time of its bloſſoming; for till then it was free from every appearance of defect whatever. This, however, did not relax my reſolution of endeavouring, by every means in my power, to inveſtigate the true cauſe; whether it originated from any defect or imperfection in the ſeed, or was *principally* owing to a deſtroying diſtemperature or blighting principle of the air.

The next year, 1788, was very favourable to the growth and ripening of wheat. The ſummer was dry and healthy, and the corn ſound and good, though the ſtraw very ſhort and ſcanty. The ſeed I ſowed was of my own ſaving, of the ſame year's growth, and ſowed on the ſame land, without any change whatever, yet I had no ſmutty wheat that year, and therefore no opportunity of making remarks. The next ſeed time I had a mind to try the white cone wheat, and therefore procured my ſeed from a different county, and took all the uſual precautions to guard againſt the ſmut. The ſeed was perfectly ſound and good, yet I had not a ground that was perfectly free from it this year.

Moſt of my wheat this year was ſown in drills at various diſtances, for the ſake of experiments, and was all horſe and hand-hoed. In the months of

April and May it was amazingly fine, ſo as to b the admiration of all that ſaw it. The farmers in the neighbourhood declared they had never ſeen any thing equal to it before, for height, ſize, vigour, ſtrength of ſtalk, and length of ear. In this flouriſhing ſtate it continued till above the middle of June. About this time the weather grew cold and ſtormy, and continued ſo till towards the end of July, a few fine days intervening. The wheat was now in full bloom, but frequently ſtripped of it by the haſty ſhowers that fell. Such, however, is the wonderful œconomy of nature, that if wheat be ſtripped of its bloom by the intemperance of the weather, a fine warm day reinſtates it, and the bloom becomes as fair and promiſing as ever. This I have obſerved it to do ſeveral times in alternate ſucceſſion; but there is a limit which the return of the bloſſoms cannot ſurvive, and if it happen before the embryo is duly impregnated, then the kerning or granulating ſucceeds badly, and at harveſt the corn proves defective and ſmutty.

During the growth of the corn this year (1789) I was very attentive to it from the firſt appearance of the ear in the ſide of the ſtalk to the time of its maturity. Soon after the ſhowery time abovementioned, I obſerved a great number of the ears turned quite brown, as if they were ripe; but upon examination they proved to be abortive ears, without any corn in them; they handled as looſe and ſoft as corn that had been threſhed. This circumſtance ſurprized me very much. To ſee corn, which ſo ſhort a time before was ſo very fine and *flouriſhing, prove to be nothing more than chaff, was exceedingly mortifying indeed!* I imagined the roots had been deſtroyed by ſome inſect or reptile; but, upon examination, I found them as ſound and perfect (as indeed was the whole plant, the ear only excepted) as corn could poſſibly be.

Soon after this, I obſerved the ſouth ſide of one of the fineſt fields was grown very ſmutty. It was ſufficiently diſcouraging to ſee corn five feet high, with ears five or ſix inches long, and as healthy and vigorous as ever was ſeen, in a few days converted into ſmut. This unwelcome circumſtance furniſhed opportunities, more than enough, to exerciſe the moſt inquiſitive mind in ſearch of the cauſes of thoſe evils, which blaſt at once the hopes and expectations of the moſt ſagacious and induſtrious huſbandman. To inveſtigate the cauſe, I began by examining the roots of the ſmutty ears, then the ſtems or ſtraw, the joints, and every part up to the ear, in any of which no defect whatever was to be found. I had not proceeded far, however, before I obſerved, that both ſmutty and ſound ears were frequently produced and nouriſhed by the ſame root, and conſequently were both produced from one and the ſame individual ſeed. This circumſtance alone goes very far towards proving, that the cauſe of the ſmut does not exiſt originally in the ſeed; for if its *ſtamina* were vitiated or corrupted, it is not poſſible to conceive that it ſhould produce plants ſound, healthy, and vigorous, for eight or nine months, and then ſome ears full of corn perfectly ſound and good, and others nothing but ſmut balls.

Not fully ſatisfied with this, I purſued my intention, and ſpent much time in examining the ſmutty ears; I ſoon diſcovered it was no very uncommon thing for the ſame ear to contain both ſound and ſmutty corn.

In ſome ears the tops were moſtly ſmutty, and the bottoms ſound; in others the tops were ſound and the bottoms ſmutty; but more generally, one ſide of the ear was all ſmut, and the other moſtly ſound. One of the laſt ears I examined contained forty ſmut-balls, twenty-one corns that were perfectly ſound and good, and five corns that had one end ſmutty and the other ſound.

From this ſtate of facts it is hardly poſſible to reſiſt the conviction that the ſmut is cauſed by the inclemency of the atmoſphere, and that conſtantly and invariably in the ſeaſon of its blowing.

To ſum up the whole of this matter then, it ſeems as certain, as demonſtration can render it, that the ſmut is not owing to any defect or imperfection in the ſeed, but entirely to ſome corrupt vitiating principle of the atmoſphere, in the blowing ſeaſon, which blights and deſtroys the grain in ſome ſhape or another, according to the time it has been blowing, when it is ſtruck with the blight. Thoſe ears which are totally deprived of their blowings at the beginning of the ſeaſon, before the corn in its embryo ſtate is duly impregnated with the *farina fecundans*, or male duſt, become abortive, and are abſolutely without any corn at all. Thoſe that are further advanced, and have the embryo formed ready for impregnation, if in that ſtate they are deprived of the fecundating principle, either wholly or in part, the milky matter, which conſtitutes the ſubſtance of the grain, for want of the vivifying principle, is wholly, or in a certain proportional part, converted into a ball of black ſtinking powder, or ſmut. Sometimes, even after the corn is well formed and filled with the milky juice, ſufficiently impregnated with the male principle, it is ſtruck with the blight, which, though it come too late to prevent the perfection of the vivifying principle, and thereby render it unfit for ſeed, yet it is little more than two rinds, it being in a manner ſtarved, the meally ſubſtance of which the flour conſiſts being almoſt entirely wanting.

From all this it very clearly appears, that all the boaſted ſteeps prepared for preventing the ſmut are chimerical, and void of all reaſonable foundation whatever. In warm dry healthy ſummers the ſmut is ſeldom if ever found, though the land be ſown with ſeed that is ſmutty, and without any preparation at all. I would however recommend waſhing the ſeed in fair water a day or two before ſowing. By this means the light imperfect corns, chaff, and ſeed of weeds, if any, are ſeparated from the ſeed corn, ſwim at top, are eaſily ſkimmed off, and the remainder rendered much more clean and perfect.

The writer has now ſeveral experiments, in proſecution, by which the above obſervations may probably be ſatisfactorily confirmed, which he hopes to have the honour of communicating in due time. He does not preſume to claim the promiſed premium, being ſenſible he has not performed the *literal* conditions, which he apprehends no power is by any means equal to but THAT only which "rides "in the whirlwind, and directs the ſtorm." The *Power which is competent to the prevention of the ſmut in wheat, is equally ſo to the preſervation of* the bloom of the fruits of the orchard, the hop garden, from the maggot in peas, the black dolphin in beans, the fly in turnips, and the caterpillar in all the cabbage tribes, whoſe devaſtation at this very time has laid the whole country waſte. Inſtead of cabbages nothing is to be ſeen but the bare ribs of the leaves, like mere ſkeletons, the hearts, &c. being entirely deſtroyed.

However great the evil be which attends a crop of very ſmutty wheat, the ſound grain may be made clean, ſweet, and wholeſome, with little trouble, and a moderate expence, as appears by the following account:

In the year 1787 I had a great deal of very ſmutty wheat, which would ſell for little more than one-half, or at moſt two-thirds of the price of good wheat, which put me upon making the following experiment:—I took about a gallon of the wheat, and put it into a pail of fair water, and ſtirred it about well for a minute or two with a ſtubbed broom. It made the water almoſt as black as ink. This water was then poured off, and a ſecond added, in which it was again very well ſtirred, and then poured off as before. This cleared it entirely from the ſmut and all diſcolouring matter. Then, when it was well drained, it was put into a broad ſhallow pan and ſet before the fire, when in a ſhort time it became dry enough to grind; for ſtaying ſo ſhort a time in the water it imbibes very little of it, and what adheres merely to the ſuperficies is ſoon exhaled by a moderate heat. When dry it was no way diſtinguiſhable from the cleaneſt and ſoundeſt wheat, but by the ſuperior brightneſs of the colour. It had a fairer and more delicate complexion than unwaſhed wheat, by which it was to be diſtinguiſhed only, even by thoſe who had long dealt in the article and were in the ſecret. Encouraged by the ſucceſs of this experiment, I had a load of it waſhed, ſent it to a malt-houſe in the neighbourhood, and had it kiln-dried by a very moderate fire. I ſent a ſample of it to market by a neighbouring farmer, of long experience, without taking any notice to him of what had been done. He ſaid it was a very bright pretty ſample, but did not diſcover it had been ſmutty or waſhed, till he had ſhewn it to a miller of great buſineſs, who preſently knew what muſt have cauſed its brightneſs; at the ſame time he owned it was not a penny the worſe, as it was now clean and ſweet, and perfectly dry. The waſte in waſhing and drying was about two buſhels; ten ſhillings I paid the maltſter for drying, &c. which made the expence about a guinea, whereby at leaſt three or four were ſaved. From this account it appears, that a ſmutty crop is not an evil of ſuch intolerable magnitude as hath been generally thought.

In the conditions of the premium, it ſeems, are involved, what is impracticable and impoſſible. In the above account the writer flatters himſelf, that he has thrown as much light upon the ſubject as is diſcoverable by human means, and begs leave to ſubmit it to the candid conſideration of the honourable Society, whether ſuch an inveſtigation merits their approbation and *encouragement* or not.

Premiums offered for preventing evils which originate from intemperate ſeaſons and deſtroying blights, may excite invention, artifice, cunning, impoſture, and deception, but can never extend the boundary, or expand the circle of human knowledge, or human power. HE, and HE only, who can repel the malignant blaſts of the Eaſt, fraught with myriads of conſuming inſects, which originate from what and where none but Omniſcience knows, and ſubſtitute the ſoft, healing, balmy zephyrs of the Weſt, can reward the labours of the induſtrious huſbandman with plenty and happineſs!

ARTICLE XVIII.

Of River Weeds as a Manure.

[By Mr. JOHN WAGSTAFFE.]

GENTLEMEN,

IN my communication to you, inſerted in your fourth volume, concerning the extraction of river weeds with their roots, but more particularly of the river conferva, as a manure, I propoſed to give you a recital of farther experiments then begun, but of which the reſult was uncertain.

In the courſe of my addreſs I had ſpoken with a degree of confidence of the expected ſucceſs of a barley crop, in ſucceſſion to the turnips, of which I gave you an account. I have now to add, that my confidence had not betrayed me into a miſtaken eſtimation of this new manure, as on leſs than one acre and three roods, I had off ſeventy-ſeven Wincheſter buſhels of malting barley, beſides three buſhels of a lighter quality. The quantity of this produce may be aſcribed to the general well manuring for turnips with common dung; but on thoſe ſpaces where none of that extended, a larger produce was apparent; and even on the worſt part of a field dibbled with wheat, and where, from its quite oppoſite quality to a gravelly height on which

the

the weed-manure was ſpread, half ſteril as this ſpace was, were produced ears cloſer, larger, and with fuller grain, than on a deeper ſoil extended on a level round it, which had a natural advantage, and a dreſſing of common manure.

On a part of that ſpace which I have in the former experiment mentioned, where this compoſt was almoſt entire, and where ſavoy and turnip cabbage grew, in the ſpring of this year I planted ten whole potatoes, at about eighteen inches diſtance from each other, whoſe average weight was about four ounces, and equidiſtant; the parings of about fourteen potatoes in nine diviſions; the produce as taken up the beginning of October, was from the ten whole ones twenty-nine pounds four ounces; from the nine diviſions of parings twenty-nine pounds twelve ounces. From among theſe latter (a caſe of ſome admiration to me) there aroſe the largeſt bulbs; two from theſe parings weighing thirty-one ounces: the two largeſt from the whole ſets, twenty-five ounces: it may be requiſite to remark that the parings were from larger roots than the whole ſets. Theſe, from being pared thick, might have their groſs weight diminiſhed about one fourth, the other three-fourths anſwered their uſual purpoſes. It may not be an uſeleſs intimation to obſerve,

obſerve that ſuch parings, in every ſoil and ſituation adapted for the uſual ſeed, will prove an effectual ſubſtitute for the whole potatoe, and the farinaceous ſubſtance of this moſt edible root may be applied to all its culinary purpoſes.

I have extended this river-weed compoſt, the laſt ſeaſon, over a piece of land ſown with turnips, which appear with a ſuperiority to others bordering upon them. Another tract of land ſpread ſolely with this compoſt was ſown with turnip-rooted cabbage, in the manner begun (I preſume) and ſucceſsfully purſued by Sir Thomas Beevor, as publiſhed in your third volume; theſe are in a proſperous ſtate, and ſurpaſſing in ſize ſome I had on better land the preceding year, which were well manured, but not with the river compoſt.

In fine, upon a review of the paſt and preſent proſperous appearance of every grain and foddering root, that it hath unfailingly and effectually ſupported, I cannot help being decided in my opinion, that on all arable lands, ſuch only excepted as are ſpringy, or liable to inundation, it may be more ſucceſsfully applied than the very common and frequently repeated manure, by which ſoils are renewed in their ſtrength.

The vaſt quantities of rank weeds and plants which abound on the banks of the numerous rivers and ſtreams of this country, ſeaſonably cut, and fermented and incorporated with other articles, for manure, according to the judgment and convenience of the farmer, might prove of no ſmall national benefit.

I am, Gentlemen, yours, &c.

Norwich,
Nov. 26, 1788.

J. WAGSTAFFE.

ARTICLE XIX.

On planting Trees on barren Heights.

[By the Same.]

GENTLEMEN,

ABOUT twelve years ſince a field of elevated land came into my poſſeſſion; the height of it had been left uncultivated for a courſe of years, on account of its unproductive quality. The aſpect being open to the ſouth, and its ſoil a deep ſand, except its ſummit, which was gravel; I with pleaſure embraced the opportunity of planting it, and had in view different ſpecies of American trees, raiſed from ſeeds about three years before, and which had in general exceeded in length of bole, for their age, any of the native trees of Britain that I had known raiſed from ſeed. I therefore promiſed myſelf, in this heated aſpect, an advantage approaching to that of their proper climate. At the ſame time I planted pines or firs of different diſtinctions, and of every ſpecies of foreſt trees frequent in our woods; and in which were included the three poplars, conſidered as the aborigines of our country.

The pines more generally died, (ſave on the ſummit) unleſs I here except the larch, which, if it lived, poorly throve; the Americans lived without increaſe, periſhing in the winter as low in their branches as their unvigorous ſummer ſhoots extended. The birch and the ſycamore ſucceeded moderately on this ſandy ſlope, but no other worthy of notice, ſave the white poplar and the aſp, *(populus alba & tremula)* the former ſucceeded with a ſingle exception beyond any inſtance of its growth I ever ſaw. A rooted cutting, tranſplanted here about five feet high, is now in height near or full thirty feet, is in girt eighteen inches five feet from the ground and thirteen feet up its trunk; I believe there are branches nine feet in extent. Yet this progreſs makes but a part of the obvious value of this tree; from its roots extending in every direction through the porous ſoil, new trees are annually riſing, whoſe yearly ſhoot is frequently more than equal to the ſtature of the parent tree when firſt planted, and the two earlieſt of the offſpring, which aroſe about ſix years ſince, are from thirteen to fourteen feet high. I don't know that I am able to number the progeny of this ſingle tree, a little copſe having ſprung in an area of thirty-five feet diameter: many of the young ones are tranſplanted elſewhere. The *populus tremula*, which I have introduced with this, has the ſame facility of throwing out its lateral ſhoots, but their growth is not equally vigorous with the *alba*, nor is their wood in a ſtate of maturity held to be of equal value. In fine, the motive to this recital is to carry an information of the experienced uſe that may reſult from planting ſuitably lofty ground, of ſuch ſoil and expoſure; whereby it may be compelled by the adaptation of a few proper trees to become an ornamental and beneficial wood, after a few years growth; yet while their growth may ſuperſede the neceſſity of planting other trees, their cloſe and broad foliage, by excluding the ſun, prepares the ſhaded ground for the reception of other trees, that would otherwiſe have periſhed beneath his beams. I have in the laſt four years replaced with ſucceſs many ſeminal plants, where a more general failure of their ſpecies was known before.

I can hardly quit the ſingular and uſeful progreſs of the Arbele, without mentioning its proſpective appearance when planted on a lofty ſcite; the ſilvery nether ſurface of its leaves, lifted by the gales, exhibits a ſcenick beauty peculiar to itſelf.

But ſcenery was not my object, notwithſtanding the frequent intimate union betwixt uſe and beauty; I meant only to illuſtrate by facts, that ground circumſtanced as the aforementioned may, by a judicious planting of theſe trees, be covered in a few years with a ſelf-propagating wood. A fall of the early matured timbers leaves room for the augmentation of their natural ſucceſſors, already coming forward, while their roots are extending to ſupply the ſpaces of thoſe which are in ſucceſſion to be taken away; ſo that in point of profit alſo, the object fully recommends itſelf.

I had an intention of connecting with this the means purſued for correcting and planting a ſoil and ſituation, in the greateſt extreme different from the foregoing, (boggy and moraſſy ground) but having miſplaced ſome minutes reſpecting it, I purpoſe to take an early opportunity of recovering them, and to tranſmit their purport to you; and am, with much regard,

Your reſpectful friend,

Norwich, JOHN WAGSTAFFE.
Dec. 5, 1788.

P. S. In your laſt publication is given an invitation to counties remote from your own to ſend ſcions from known and valuable fruits within their diſtricts; I therefore wiſh to inform you, that the longeſt undecaying apple that I know of, well known here by the name of Beefin,* and which anſwers every culinary purpoſe, is frequent in the orchards of our farmers, and has ſometimes been planted in hedge-rows, where they retain their priſtine quality. Indeed, the prejudice of the country makes this apple to degenerate in any other county; but as this prejudice has no known ſupport, I wiſh it to be diſregarded, and the growth of the tree extended. It may poſſibly degenerate faſter than ſome others, by its proximity to other ſpecies of apples; but this poſſible inconvenience may be guarded againſt in the plantation. I therefore hold myſelf ready, at your time, if requeſted through your Secretary, to tranſmit ſcions of this fruit.

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* Named, I have no doubt, from its rind exactly reſembling that of the fleſh of the beeve.

ARTICLE XX.

Hints for ſowing various Kinds of Grain, from certain Phænomena of Nature.

[By the Same.]

GENTLEMEN,

HAVING often been impreſſed with the idea, that a better rule might be obtained for the ſowing the various ſpecies of grain, than what could be regulated by the calendar, I at length determined to make minutes of my own periods of ſowing, as they were in coincidence with the bloſſoming of well-known trees; or on the return of various birds of paſſage; together with either the earlieſt voice or ſong of either theſe, or thoſe which are ſtationary to our climate; with other eaſily obſerved adjuncts, which might have a tendency to direct this material buſineſs in agriculture. Not confining myſelf to my own experiments, I made frequent remarks on divers of my neighbours, and endeavoured to aſcertain the fullneſs or thinneſs of their crops, as they might be at various times ſown, in correſpondence with the voice or appearance of many of the well-known ſubjects of nature. Theſe remarks have been continued through ſeveral years, by which I conceive I have often diſcovered when the ſowing was too early in one year, which in a ſubſequent one might be too late, though on the return of the ſame days of the month; yet from the latter circumſtance more crops appeared to be leſſened by a protraction *beyond* the beneath-recited periods, than ſowing with the earlieſt coincidence with them; to inſtance the preſent appearance for the greateſt product of barley, is from the ſeed ſown on the earlieſt ſound of the cuckoo, and while the buds of the black-thorn were yet turgid, than what was delayed to the frequent note of the former, and the expanſion of bloom in the latter.

It is poſſible that the following hints may lead ſome practical farmers to be directed by certain phœnomena of nature, that more generally occur within their obſervation, as it is well known that there are local ſubjects in the vegetable and animal kingdoms, that are not diffuſed through the nation; yet as thoſe I have governed my obſervations upon are more general, I ſhall therfore ſubjoin thoſe whoſe appearance has been apparently moſt propitious, when adapted to the ſowing of the following grain, pulſe, and roots:

Peas and *Spring Vetches.* As early as the lark ariſes to ſing, and partridges are paired.

Oats. When rooks begin to build, and the male bloſſoms (catkins) of the hazel expand and ſhed their farina.

Barley. At the earlieſt diſcovery of the cuckoo, and the white-ſwoln buds of the blackthorn.

Cabbage, and *Turnip-rooted Cabbage.* At the appearance of the hyacinth, (blue-bell) and when the ring-dove (wood-pigeon) begins to coo.

Potatoes. When the wilding or crab apple is in bloom; and perhaps the due period of taking them up is at the dropping of its fruit.

Buck, or *Brank.* When the hawthorn's bloom is going off with a purple hue, and the young rooks are perceived out of their neſts.

Turnips. When the elder flowers, and the early cherry ripens.

Wheat. At the fall of the aſhen leaf, or when the grey or Royſton crows return; but theſe being only local viſitants, moſt of the inhabitants in ſeveral counties not being acquainted with them, their return is in correſpondence with the lateſt fall of the acorn and the variegated appearance of the woods. On the appearance of the fieldfare the due period is paſt.

I think I am not deceived in my obſervation, that wheat thus timed is not winter-proud, and is leaſt hurt by its poſſible ſeverity, tillering more freely in the early ſpring, and conſequently becoming more productive.

This theory of ſowing has been ſuggeſted, and if I remember right recommended by two diſtinguiſhed naturaliſts; viz. Doctor Stillingfleet, in his Calendar of Flora, and Doctor Goldſmith, in his Hiſtory of Animated Nature; nor was it unthought of in earlier periods of Engliſh huſbandry: I have heard a provincial adage from the mouth of an ancient farmer, viz.

> " When the ſloe-buſh is as white as a ſheet,
> " 'Tis time to ſow your barley, dry or weet." [*wet.*]

Indeed the principle, I conceive, is ſelf-evident, " If the ſtork knows his time, and the ſwallow his ſeaſon of coming;" and as it is a fact that the birds of paſſage are not always periodical to a day, to a week, perhaps to a month; it will almoſt be neceſſarily educed, that their ſubſiſtence is not prepared, that nature hath not undergone a change proper for their return, and in courſe ſhe is not ready ſor a production that their appearance might denote the period for.

I am not inſenſible that an objection to this indicative ſowing may ariſe, from the obſervation that the emblosſomed tree is often blaſted, and the expectation of fruit defeated; that nature herſelf, not being uniform in her promiſe of plenty, it evinces ſhe can rear no certain ſtandard to determine the proceſs of art. There is ſome weight in the objection; but as the caſual poverty of an induſtrious œconomiſt ſubverts not the general ſucceſs of œconomy; and as there is ſcarcely a general rule without exception, the objection is much weakened.

I am, with reſpectful regard, &c.

JOHN WAGSTAFFE.

Norwich, Sept. 9, 1789.

☞ It is with ſome diffidence that we can allow Mr. Wagſtaffe's opinions to appear in this queſtionable ſhape; but ſince he delivers them as the reſult of continued obſervation, we are willing to give him credit for care in his memorandums.—And the ſubject is worthy the conſideration, at leaſt, of the practical farmer.

ARTICLE XXI.

Remarks on Smutty Wheat.

[By the Same.]

GENTLEMEN,

IT has been an eſtabliſhed opinion with moſt farmers, that ſmutty wheat, or that in which the black or ſmutty balls are frequent, if ſown, will aſſuredly be productive of a foul crop. And it is queſtionable with many, if any cleanſing with water, or ſteep in any lixivium, will thoroughly purge its foul quality, ſo that no pollution be conveyed to the future produce.

I therefore beg leave to recite an experiment which hath had a notable effect in obviating, as far as it has been carried, the ſettled prepoſſeſſion againſt ſowing any wheat apparently cleanſed of this contaminated quality. And what I hold of a ſuperior uſe, a ſtrain of wheat has been procured, (by what operation of nature I do not profeſs to have diſcovered) which hath obtained the reputation of one of the beſt varieties known in the diſtrict in which it is grown.

A neighbour of mine at Baburgh, a ſpeculative and practical farmer, walked into a ſmall piece of wheat which I had ſown with blended but common ſtrains of wheat, and in his walk he gathered ſome ears of ſmutty corn; in the examination of which he detected in four of them eight or nine ſound grains; which grains he reſerved, and at the common ſeed-time drenched with brine, which he uſually prepared for his ſeed, and planted them in his garden in the year 1783. Theſe grains produced many ears in 1784, which were generally cloſer ſet, and more numerouſly productive of grain than the frequent ſtrains of wheat. He ſelected the cloſer ſet wheat, and dibbled in their grain, ſeparate from any other;. the produce of which was about a quarter of a peck. In 1785 thoſe dibbled in the ſame manner, that ſeaſon, produced in the following autumn about half a buſhel, which produced by the ſame mode about nine buſhels in 1787, which he principally retained, and had dibbled on ſeveral acres; the general produce of which, where he preſerved his wheat unblended, was uniformly of the quality of the reſerved original ears of 1784. In 1788 he diſtributed for ſeed (above his own reſerve) to his relations and friends. I had four buſhels of this unmixed quality, which preſerved its ſpecifick appearance, and attracted the notice of many farmers, one of whom has ſolicited and obtained from me twenty-four buſhels; and ſeveral buſhels beſide are in reſerve, or already committed to the ground.*

I found it difficult to be leſs circumſtantial, if I would be explicit; and as a reference to what has been experienced, ſpeaks more ſtrongly than mere deſcription, you will excuſe a poſſible redundance; yet I may add, that this peculiarly acquired wheat continues perfect in its quality, and largely productive of quantity. In the laſt inſtance none of its ſeveral promoters, but are ready and have declared, that their *caſt* has been from four to eight buſhels per acre more than their ordinary produce on land equally tempered, and under a ſimilar mode of propagation. I cannot yet ſpeak to my own abſolute produce, as nearly half remains unthreſhed; but I believe it will be more than in proportion to the largeſt quantity mentioned by my neighbours to have grown on the land before. I may farther add, from different repreſentations I have received, that it is perfectly devoid, through the ſeveral trials it has undergone, of the polluted ſtrain from which it originated. I repeatedly walked down the furrows where mine grew, without detecting any approach to ſmut; nor has any diſcovery of this pernicious ſubſtance been made in what has been prepared for the ground, I therefore cannot but repeat, and conclude, that a variety as profitable, and a ſtrain as pure, has ariſen from this experiment as could have reſulted from a more elaborate proceſs; and with a certainty that it has hitherto ſuited all the land on which it has been tried.

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* Its uſe I conceive is extending; at this time the clerk of the county (P. French, eſq;) is ſetting about five acres of the ſeed within a parochial diſtrict of this city.

I am, your *reſpectful friend,*

Norwich, JOHN WAGSTAFFE.
Oct. 21, 1789.

ARTICLE XXII.

Improved Method of planting Aſh for Hurdles, Hoops, Laths, Fencing, and what is termed Poſt and Billet for Collieries.

[In a Letter to the Secretary.]

SIR,

BEING lately on a viſit to a friend in Warwickſhire, who lives under Edgehill, I was greatly ſurprized to ſee ſome parts of the declivity covered with fine regular plantations of Aſh, whilſt the remainder was either overrun with ſhort furze and ruſhes, or drenched with ſtagnated water. On enquiry I ſound that the improvement had been begun by my friend's father about twenty years before, and has from time to time been extended both by father and ſon:—That the average price of each acre, when cut at fourteen years' growth, was 70l. though the boggy part, before this mode of cultivation, was not worth a farthing. From the ſtocks or ſtumps when cut, a larger crop accrues the next fourteen years, and ſo on perhaps, for more than a century. After each cutting it is proper to cover, or rather to earth up, the old ſtocks with the mould that may have fallen from the ſides of the beds into the ditches. The uſual price of planting and fencing with quickſets is not more than 8 or 9l. per acre. The plantation was thus begun:—As the hill was to be drained, a line in the direction of the hill was drawn from the top to the bottom of the ground intended to be planted; the aſh-plants of three years old, having their tops and roots ſo cut as not to exceed eight or nine inches in length, were laid horizontally on the ground at the diſtance of three feet and a half, the top part of each plant projecting about half an inch beyond the line: then the labourer, beginning at the lower end of the plantation, that the water may drain off as he goes on, and ſtanding with his back to the hill, with his ſpade digs the earth from the line on his right to the diſtance of twenty-one inches, on his left to the depth of twelve or fourteen inches, or what he may think ſufficient to carry off the water, and effectually to cover the roots of the plants: he then removes the line in a parallel direction three feet and a half from its former place, lays the plants in the ſame order as before, and digs out the remaining twenty-one inches to the ſame depth as before, and throws it on the left hand bed;—thus a ditch of three feet and a half wide is effected:—and as each plant is three feet and a half aſunder in the beds, and the ditch is of the ſame width, each plant has a ſpace exactly three feet and a half ſquare to extend itſelf in. Then the line is again removed three feet and a half further to the left, when the ſame proceſs again takes place; care however ſhould be taken that the plants ſhould never be laid immediately oppoſite to each other, but one oppoſite the opening between two others, thus, * * * * * * * * *

In this mode of cultivation, not only the land is effectually drained, but the plants have alſo a double portion of vegetable earth, and are thereby enabled to force their horizontal roots rapidly through the bed. Inexperience may perhaps object, that the plants being laid horizontally will not make perpendicular ſhoots, but nature gives them a perpendicular direction, lay your plants in what manner you pleaſe. After planting, no further attention is required, but to cut off any crooked or ſtraggling ſhoots, and to hoe the plants for the firſt four years; —the fences alſo muſt be well ſecured. Timber-trees may be planted to advantage in the middle of the beds, in ſquares of fifty or ſixty feet, and if oak, may probably arrive at maturity by the time the ſtocks begin to fail.

The method of raiſing quickſet hedges alſo in that part of the kingdom is a very improved one; which is to mark out the ground intended for the fence with a line, on which lay your quickſet plants, cut in the ſame manner as the aſh, at the diſtance of eight inches from each other; then cut a turf cloſe by the edge of the line eight inches thick, lay it when inverted upon the plants, and ſo on till the whole diſtance is compleated; then lay another row of plants at the ſame diſtance on this turf, one in the opening of that below, which cover with another turf dug on the outſide of the other, taking care that they are both laid on an inclined plane from the ditch, which muſt now be made by throwing up the earth dug under the turfs, to the depth of eighteen inches, to form the bank, and afford nouriſhment for the roots of the plants. The hedge muſt then be fenced with hurdles or poſts and rails, otherwiſe the cattle will ſoon deſtroy it. In four or five years the hedge will be out of danger, if in the mean time it has been well weeded at leaſt twice a year. The quickſets ſhould not be tranſplanted into the hedges till they are three or four years old, or about the ſize of a large gooſe-quill, and have been regularly cut down to the ground every year ſince they firſt made their appearance in the nurſery; —this proceſs will increaſe their ſhoots more than double. Any of the large roots, which are cut off on tranſplanting, will form new plants, if immediately put into the ground about three inches diſtant in the rows, and ten or twelve between the rows, to enable the hoe to paſs between them;—the tops ſhould be about half an inch above ground. Thus two years are gained in raiſing new plants, inſtead of adopting the old mode from ſeed.

Should theſe obſervations be deemed worthy the attention of the Society, and calculated to promote the object of it, the diſſemination of uſeful knowledge, they are much at their ſervice, from

Sir, your very faithful friend,

And obedient humble ſervant,

W. B. B.

ARTICLE XXIII.

On the Advantage of Hoeing.

[In a letter to the Secretary.]

SIR,

THE Bath Society frequently beſtows premiums on perſons who raiſe the heavieſt and cleaneſt crops of turnips, that have been twice or more times hoed. Might it not be right to extend theſe premiums to every ſpecies of corn and pulſe, as none can doubt but thoſe would receive equal benefit from the uſe of the hoe? The farmer who may be tempted to introduce the hand or horſe-hoe through every part of his arable land, would find very little occaſion to make uſe of manure, and might totally extinguiſh both winter and ſummer fallows. If he doubt the truth of this aſſertion, let him try the hoe upon one half, or a leſs part of his ploughed land, without any manure, for five ſucceſſive years, and cultivate the other part of his farm agreeably to his uſual mode, for the ſame term of years, and I pledge myſelf, that double the crop will be obtained from the land whereon the hoe has been effectually uſed, to that which can poſſibly be raiſed upon any lands that are manured and fallowed, or cultivated in the old or common way.

The following account, it is preſumed, may induce gentlemen and unprejudiced farmers to try the experiment:—

A near relation of mine cultivated a field for upwards of twelve years as follows, and had every year uncommonly large crops. The firſt year peaſe were ſown in drills, two feet ſix inches apart, which were twice hand-hoed, and afterwards earthed. They were gathered green, and ſent to market, and the ſtraw or haulm was cut and uſed as fodder for horſes. The whole crop was cleared by the 15th of July. The ground was immediately ploughed and ſowed with turnips broad-caſt, which at the proper ſeaſon were twice hoed, and were ſold for 5l. per acre to a cow-keeper, who cleared them from the land the beginning of February in the ſecond year. Another ploughing then took place, and after the earth was well pulverized it was ſown with ſpring wheat, broad-caſt, which was never hoed or weeded, nor did it require it. When this crop was cleared in the autumn of the ſecond year, the ground was ploughed without delay, and ſpinage was ſown in four-feet drills; this ſtood the winter; and midway between theſe drills garden beans were planted the following January, or the third year; both crops were hoed. The ſpinage was part ſent to market, and part given to cows, and was cleared by the middle of May. The ground then received another hoeing, and on the ſame drills where the ſpinage grew, cabbages (that had been previouſly raiſed in a ſeed plot) were planted. The beans ſtood for ſeed, and were ſold for 8s. per buſhel to a London ſeedſman. The cabbages were carried from the land, and given to milking cows about the month of February; nor was it thought right to ſuffer any crops to be fed off this land, fearing the beaſts might injure it with their feet, and that the water might ſtand in the holes their hoofs had made; none but the lighteſt ſoils ſhould be trod with cattle. The ploughing commenced for the fourth year immediately after the cabbages were removed; and after the ground was well pulverized, peaſe were ſown in drills three feet aſunder; theſe were gathered and ſent to market in the pod, and after the haulm was removed, coleworts (which had previouſly been raiſed in a ſeed plot) were planted about twelve inches diſtant from each other; theſe were a good crop, and were ſold to the cow-keepers. Thus were eight profitable crops obtained in four years, more than twice ſufficient to pay for the fee of the land.—So far ſays the journal.

I was an eye witneſs to the crops which were raiſed upon the ſame land the eight ſucceeding years, and knew them to excel all in that neighbourh[illegible] The mode of cultivation was nearly the ſa[illegible]cept that barley was ſown one fourth year, inſtead of the ſpring wheat; oats were ſown once in like manner; and potatoes were once planted between the drills of ſeed beans; and the hoeing was always attended to and well performed, except when the land was ſown with corn. The ſoil was a light loamy clay of a duſky hue, under which was gravel, at the depth of about thirteen inches. The real value of the land was not more than 20s. per acre; it has been lately laid down with graſs, and is come to a good ſward, without having any manure laid upon it for more than ſixteen years, twelve of which it was cultivated as before related.

Surely this proof may encourage farmers to try the hoe upon a large ſcale and on different ſoils.

I am, the Society's moſt obedient ſervant,

JOSIAH HAZARD.

Holt, *Dec.* 18, 1788.

* * *

ARTICLE

ARTICLE XXIV.

An Account of the Guinea and Sc[illegible]raſſes, and the Manner of cultivating them in the Weſt-Indies.

[By J. SPOONER, eſq; to the Secretary.]

SIR,

THE Guinea and Scotch graſſes, produced in the Weſt-Indies, and of which you deſired an account, are of ſuch great utility, that the preſervation of the ſtock there frequently depends upon them.

The *Guinea graſs* appears capable of thriving in any ſituation, in reſpect to climate and ſoil, and can bear the effects of dry or wet weather in a moſt remarkable manner.

In wet weather it grows ſo faſt, that it may be cut once in a fortnight, and ſometimes oftener, when the land which yields it is new or fertile.—In dry, it is a long time before it withers, and, when reduced thereby to ſuch a ſtate as to ſeem totally deſtroyed, will revive with a ſlight ſhower in a very few hours; and when rain falls, though in ſo ſparing a degree as to be of little or no ſervice to common paſtures, it will occaſion this to vegetate, and to be fit for uſe in a few weeks: nay, in ſome ſituations, not too much expoſed to the heat of the ſun, it is known to flouriſh, and derive ample ſupport, from occaſional dews only. It has, farther, ſo peculiar a quality of ſtocking, that, with very little care in its infancy, it will overcome all other graſs and weeds; and in ground full of ſtones and rocks, though planted at very great diſtances, at random, as the appearance of ſoil admits, will ſpread itſelf about them, in a few months, and at laſt cover them entirely. This graſs, when ready to feed, is from ſix to eight feet high; but it is generally fed upon, or cut, when only three or four.

It agrees with all kinds of ſtock; and horſes, mules, and cattle, when turned out to feed upon it, will fatten ſo faſt, that the two former will be in good condition in a couple of months, or leſs; and the latter will become fit for the butcher in the courſe of three months.

The cultivation of this graſs is very eaſy, and attended but with little care, expence, or trouble. It is not immediately produced from the ſeed, but is previouſly planted. The land intended for it is generally made perfectly bare by hoeing, and holes are then dug thereon, from three to five feet diſtant,

tant, varying in this reſpect according to the quality of the ſoil; that is, if it be rich, the holes are to be made at a greater, and if poor, at a leſs diſtance. Theſe holes ſhould be large, and deep enough to admit, and bury a good depth, a few roots of the graſs. The roots to be planted are dug up from a neighbouring field, or nurſery; and the graſs ariſing from them being topped, within three or four inches, they are put into each hole, and well covered with earth, preſſed down by the foot. Care is taken to keep the plants free from weeds by repeated hoeings. The months moſt approved of for planting, are April and May, as the graſs will then ſeed in September and October, at which periods it is found to ſeed by far the moſt abundantly. It is neceſſary to be careful that the ground is quite clean when the ſeed is ready to drop; and if the ſpaces between the roots are then ſtirred up with the hoe, it will be found very beneficial.

When the ſeed is all fallen, ſtock is turned in to tread it into the ground, and feed upon the graſs. In very rich and new land, the graſs at firſt will grow ſo rank as to produce very thick ſtalks, which, by running up the noſes of the ſtock, will prevent them from eating it ſo cloſe as they otherwiſe would. When, however, it is eaten as near the ground as poſſible, the remaining graſs, with the roots which were planted, are dug up with the hoe and burnt off. The graſs after this, if favourable rains attend, will grow from the ſeed, and by covering the ground in the month of May following, will be perfectly eſtabliſhed for ſeveral years, according to the quality of the land, ſo as to be cut for uſe, or become a paſture.

Whenever the graſs grows thin, holes may be opened in ſuch places as may occaſionally appear ſo, and roots again planted to ſupply it; and, by this attention beſtowed upon it, a field will ſcarcely ever be ſo totally worn out as to require the labour of being at any one time replanted.

The blades of this graſs, when flouriſhing, appear not unlike thoſe of wheat, only rather broader and longer; and the ſtalks, during the firſt growth, are alſo much like thoſe of it, but they get weaker and leſs, the oftener the graſs is fed upon or cut, till at laſt it becomes a fine, rich, and entire ſwarth.

The mode of cultivation already mentioned is the one generally approved of, but Guinea graſs may alſo be brought to perfection by other means. The ſtalks being buried a few inches deep, each joint thereof will take root, and grow luxuriantly;

or it may be produced directly from ſowing the ſeed, the ground being previouſly prepared for that purpoſe. This laſt mode is not preferred, on account of the ſeed lying many months in the ground before it makes its appearance. Some planters do not ſtock up the roots which are planted, as before related, when the graſs has ſeeded; and ſome depend upon what they afford, by continually feeding upon, or cutting the graſs when at a certain height, without ever allowing it to ſeed. But, in compariſon with the firſt, all theſe modes of management are to be eſteemed as inferior.

The *Scotch graſs* is chiefly produced in low, marſhy lands, that have a running ſtream or river through them, and can be eaſily overflowed when dry weather would affect it. It is generally cut for uſe, and given to the ſtock; and in good ſeaſons, that is, if light ſhowers now and then aſſiſt, will admit of cutting once a week or oftener.

The blades of this graſs are longer, broader, thicker, and of a darker green, than the Guinea graſs; and the ſtalks much larger, and more juicy and pithy. It is an excellent food for horſes, mules, and cattle; but is not made uſe of, and perhaps is not ſo well calculated for ſheep, or to fatten cattle, as the Guinea graſs. In general it is merely appropriated to the ſtable; and the quantity which the ground yields, and the quickneſs of its growth, render it very uſeful and valuable, particularly near towns in the Weſt-Indies, which afford a market for it.

This graſs is alſo cultivated by being planted, which is thus accompliſhed:—The land is freed from all weeds, ſedges, and rubbiſh, by their being clean hoed, and burnt off, and requires to be laid out ſo as to admit of being overflowed; and alſo to be ſo well drained, that no water can lodge to ſtagnate, and deſtroy the graſs. The graſs to be planted is cut into junks, every joint thereof, which is from five to ten inches long, being a junk, or plant. A ſingle one is ſtuck in the ground with the joint downwards, and in this manner they are diſtributed at random, ſo as to be about ſix or eight inches apart. In a few hours theſe joints begin to ſhoot, and take root; and in the courſe of three weeks, or a month, the graſs will grow ſufficiently high to be cut, which is when it is about ſix feet. As the graſs grows, weeds and all extra productions are freed from it, by being pulled up as they appear, and put into heaps to be dried and burnt off. Care is taken when it is cut, alſo to weed at the ſame time; with which management, and attention that the drains be kept open, that it may be overflowed when dry weather hurts it, and ſupplied in all places as they appear thin, by ſti[illegible]ing junks in, as before deſcribed, the land is perpetually eſtabliſhed with the graſs, and yields it in a moſt extraordinary abundance.

ARTICLE XXV.

Experiments on Drilling.

[By Sir JOHN ANSTRUTHER, to the Secretary.]

SIR,

I Send you ſome ſmall experiments I made on my crop of 1787. The produce of part of it being late in the ſeaſon before it was threſhed, it was late in the year before I received the account of it.

I am ſorry to obſerve an error in the publication of the laſt experiment I ſent to the Society, of crop 1786.

Page 262, line 3. "With partitions of fourteen inches, *two intervals three feet four inches.*"

I cannot imagine how I could have overlooked ſuch a blunder in the copy.

There could not be two intervals, and had the ridges been of equal breadth, the interval would have been nearly four feet eight inches. But as the blunder is ſo plain, every one muſt obſerve it to be ſo. I am, Sir,

Your moſt humble ſervant,

London, J. ANSTRUTHER.
Wimpole-ſtreet, March 17, 1789.

The following Experiments were made in 1787.

One acre, ſtatute meaſure, was drilled with white wheat, after the plough, ſowing by hand the firſt furrow, and another plough following and covering the ſeed; and the ſeedſman ſowed the third furrow as the firſt, ſo that the rows were at 18 inches. This field was drilled beans the former crop, and drilled in the ſame manner.

The wheat was drilled upon one ploughing; upon this was ſown 1 buſhel and 4-5ths of a gallon. The produce was 27 buſhels and 3 pecks.

The ears upon four yards were counted. One yard produced 82 ears, one 87, one 98, and one 88. The average is 88 ears per yard.

Three acres and three roods were ſown next to it *broadcaſt* with the ſame wheat.

	B.	P.	G.		B.	P.	G.
Upon this was ſown	10	3	1	which is per acre	3	0	1
The produce was	30	2	$0\frac{4}{5}$ per acre.				

AGAIN:

The ſame meaſure of one acre was drilled with red wheat, in the ſame manner after the plough.

	B.	P.
The ſeed ſown upon it was	1	1 per acre.
The produce was -	27	0 ditto.

Four acres next to it were ſown broadcaſt with the ſame wheat.

	B.	P.	G.
The ſeed ſown was	2	2	0 per acre.
The produce was	24	2	0 ditto.

RECAPITULATION.

White Wheat *drilled*	B.	P.	G.		*Broadcaſt.* B.	P.	G.
Produce -	27	3	0		30	2	$0\frac{4}{5}$
Deduct ſeed	1	0	$0\frac{4}{5}$	Deduct ſeed	3	0	$1\frac{3}{5}$
	26	2	$1\frac{1}{5}$		27	1	$1\frac{1}{5}$

COMPARISON.

Broad -	27	1	$1\frac{1}{5}$	0	0	$8\frac{7}{10}$	after one.
Drilled -	26	2	$1\frac{3}{5}$	0	0	$26\frac{5}{10}$	

0 2 $1\frac{3}{5}$ Broadcaſt ſuperior.

Theſe crops were twice horſe-hoed between the rows with a plough.

Red Wheat *drilled.*	B.	P.	G.	*Broadcaſt.*	B.	P.	G.
Produce -	27	0	0		24	2	0
Seed - -	1	1	0	Seed	2	2	0¾
	25	3	0		21	3	1¼

COMPARISON.

Drilled -	25	3	0	- 20 6/15	after one.
Broadcaſt	21	3	1¼	- 8 7/15	
	3	3	0¼	Drilled ſuperior.	

The next field to this was only ſeparated by a hedge, and of equal quality. It was in wheat drilled, and planted the laſt year. As the former ridges of the drilled were of unequal breadth, and that on which the tranſplanted grew was very hard, it was all croſs-ploughed, harrowed, and ridged anew. The half acre for horſe-hoeing was ridged into twenty ridges four feet eight inches, and two half ridges, in place of ſeventeen laſt year. This the ploughman did very accurately.

The other half acre was made in ridges twelve feet broad, which made each the ſixteenth of an acre. Upon this half acre was drilled (the 28th

of

of October) two pecks and a half of red wheat; it was five times horſe-hoed, and twice hand-hoed in the partitions. The produce was ten buſhels and two pecks, which is at the rate of twenty-one buſhels per acre. From which deduct the ſeed, 2 pecks 1 gallon, there will remain 20 buſhels, 1 peck, and 1 gallon, which is $16\frac{3}{10}$ after one.

The half acre horſe-hoed was hoed with a Rotherham plough.

In the rows of this were ſeveral empty ſpaces of above one foot, and it was much hurt by the birds, having a hedge on one ſide, and a hedge at one end of the ridges. And as the ridges were drilled where the furrows were laſt year, by this there was only a ſingle row on each ſide of the field upon the half ridges. This ſingle row produced but few ears, as it was horſe-hoed only on one ſide, and moſt of theſe ears were deſtroyed by birds.

The ears in a yard of four double rows were counted at different places of the field, two at the top, and two at the bottom of the field; in all, eight ſingle rows.

	Ears.		Ears.
1 yard produced	103	5 yards produced	130
	115	6 - - - -	119
3 - - - -	113	7 - - - -	128
4 - - - -	85	8 - - - -	116

Average 113 ears.

Theſe ears were much larger than the ears of the equally diſtant rows.

To ſee the proportion of the produce between theſe and the equally diſtant rows. As the latter are at 18 inches, and the breadth of an acre is 22 yards, this makes 44 rows in breadth, which, excluſive of head ridges, (ſuppoſe 6 yards for the two) makes 9416 yards drilled.

In the drilled and horſe-hoed with two rows upon 4 feet 8 inch ridges. As there are fourteen in the breadth of an acre, or 28 rows, and 220 yards in length of an acre, excluſive of head ridges, of 6 yards for the two, making 168, there remain to be drilled 5992 yards; which are 3424 yards of rows leſs than the equally diſtant, or above one-third, or as 3 6-10ths to 6 4-10ths.

The equally diſtant rows produced 25 buſhels and 3 pecks. And the horſe-hoed produced 20 buſhels, 1 peck, and 1 gallon, which is 5 buſhels, 1 peck, and 1 gallon, leſs than the equally diſtant, or nearly one-fifth leſs: but the proportion of yards was one-third. If the produce of the horſe-hoed had been the ſame as the equally diſtant rows, in proportion to the meaſure, it ſhould have been 16 buſhels 1 peck; but as it produced 20 buſhels, 1 peck, and 1 gallon, this is 4 buſhels and 1 gallon more than the ſame length of the equally diſtant rows, or one-fourth more, notwithſtanding the two ſingle rows were almoſt totally deſtroyed.

And the 25 buſhels 3 pecks, the equally diſtant rows produced, at 60 pounds per buſhel, multiplied by ounces and divided by the yards of the rows, will be 2 ounces 7-10ths per yard of ſingle rows.

By the ſame calculation, the horſe-hoed producing 20 buſhels, 1 peck, and 1 gallon, will be 3 ounces 3-10ths per yard, or 6 ounces 6-10ths per double row.

By counting the ears per yard, it is alſo ſhewn there were more ears per yard. As the equally diſtant rows produced only 88 ears per yard, but 113 in the Tullian, the average ounces of the horſe-hoed is 3 3-10ths.

But from the number of ears counted per yard, being 113, if we allow 40 grains per ear, and 800 per ounce, (allowing them ſmall) the yard of ſingle rows would produce 5 ounces 6-10ths, or at the rate of 35 buſhels per acre, were the field all equally good.

Nov. 1ſt. Two ridges, or 1-8th of an acre, was planted with wheat from ſeed ſown in the garden the 15th of July; each plant was at nine inches diſtance every way. The produce was 3 buſhels, 2 pecks, and 1 gallon, which is at the rate of 29 buſhels per acre.

Nov. 2d. One ridge the ſame breadth, the 16th of an acre, was dibbled with wheat at nine inches diſtance every way, and the grains dropped by hand, in different quantities, from 3 grains per hole to 15. The produce was 1 buſhel, 2 pecks, and half a gallon, or at the rate of 26 buſhels per acre.

Nov. 3d. One ridge, the 16th of an acre, was drilled by hand; the furrows were made by hand with an hoe, at 12 inches diſtance, and the ſeed was covered with a rake. The ſeed ſown was the fourth of a peck, or half a gallon, and at the rate of 1 buſhel per acre. The produce was 1 buſhel, 3 pecks, and at the rate of 28 buſhels per acre, or 28 after one.

March 12th. One ridge, the 16th of an acre, was planted with plants from the garden, the ſame as were tranſplanted on the other two ridges on the 1ſt of November, and alſo at nine inches diſtance every way. The produce was one buſhel, 2 pecks, or at the rate of 24 buſhels per acre.

All the others were reaped the 8th and 9th of September 1787; but thoſe tranſplanted on the 12th of March were not fit to cut until the 2d of October.

All theſe were frequently hand-hoed and cleaned in the rows.

ABSTRACT.

	Produce. B.P.G.	*Part of an acre.*	*Buſhels per acre.*
Two ridges, 8th of an acre, tranſplanted Nov. 1ſt, - - - - - - - - -	3 2 1	1-8th	29
One ditto, dibbled with grain Nov. 2d,	1 2 1	1-16th	26
One ditto, drilled by hand (ſeed ½ gallon)	1 3 0	1-16th	28
One ditto, tranſplanted March 12th,	1 2 0	1-16th	24

Theſe ſmall experiments might have produced more, if they had been executed by thoſe accuſtomed to that culture, and more accurately hoed; but as they were executed by common ploughmen, not accuſtomed to drilling, or accuracy in hoeing, (as was the caſe laſt year in forming the ridges, by making ſeventeen inſtead of twenty-one) it cannot be expected to be well executed. But theſe experiments, done by thoſe men, ſhew the ſyſtem in a fairer view, and prove what may be done by any farmer to more advantage, by his attending to the execution.

I have made experiments of drilling for a great many years, and have never found any difficulty in getting it executed with tolerable accuracy by common ploughmen, either in marking out the ridges at firſt ſtraight, and of the proper breadth, or in drilling or horſe-hoeing.

ARTICLE XXVI.

On the Watering and Management of Flax, addreſſed to Sir John Miller, Bart. a Vice-Preſident of this Society.

[By JOHN GRAY, Eſq.]

DEAR SIR,

THE incloſed is the paper I mentioned to you laſt year, and which, from my neglect, was afterwards omitted to be communicated to you.

The reflections contained in it occurred to me ſeveral years ago, from obſerving, when I was laſt in Scotland, what appeared to me great miſmanagement in the watering of flax. Mr. Curtis, two years ago, aſked my leave to publiſh them in his *Flora Londinenſis*, article Flax; but as that elegant and expenſive work is not in every perſon's hands, I laſt year got them inſerted in the Gentleman's Magazine for June, and in the Public Advertiſer; in conſequence of which, experiments were made in Ireland and in Scotland, with ſucceſs, according to the reports. However, if the improvement propoſed be a really eſſential one, which a variety of experiments can alone evince, the reflections will bear being *decies repetitæ*, and on that account I propoſe publiſhing them again this year, and have ſent you this copy to be communicated, if you think proper, to the Bath Agricultural Society.

I have the honour to be,

Dear Sir,

Your moſt obedient,

and moſt humble ſervant,

JOHN GRAY.

To Sir John Miller, bart.

Extract

Extract from one of the Dublin News-Papers, for Auguſt 1787.

" It is conjectured, and with a great degree of plauſibility, that flax might be inſtantaneouſly prepared for the purpoſe of ſkutching, and all the time and labour of the preſent proceſs ſaved by immerſing it in boiling, inſtead of cold water. So far as ſpeculation may be allowed, and an analogy with the effects of cold and boiling water will hold good, there is every reaſon to think the experiment would be crowned with ſucceſs. On a ſmaller ſcale we have the authority of a gentleman to aſſert, that the above mode has been practiſed with ſucceſs. One of his undertenants had occaſion to bring ſome yarn to market, but had no flax prepared, and but one day intervened with the market: ſhe pulled ſome green flax, and merely for experiment boiled it in a large iron pot for ſome time, when it ſo fully anſwered her expectation, that ſhe was enabled to put the flax through all its operations, and bring it to market next day in yarn. *S'en eſt trop, j'en doubte.*

" I have not yet received the particulars of the experiment in Scotland; but Sir John Sinclair, to whom I ſent a copy of my reflections, tells me that a clergyman of Caithneſs of his acquaintance tried the new method ſucceſsfully, and gave him ſome flax prepared by that method, which he put into the hands of Mr. Arbuthnot, ſecretary to the truſtees for fiſheries and manufactures at Edinburgh."

Reflections relative to the Watering of Flax by a new Method, ſo as to ſhorten labour, probably too add to the ſtrength of the Flax, and give it a much finer colour, which would render the operation of bleaching ſafer and leſs tedious.

Though the following reflections have for their object an improvement in the very eſſential article of watering of flax, yet I muſt advertiſe my reader, that they are only theory, and muſt depend entirely for their truth and juſtification upon future experiments to be ſkilfully and judiciouſly made. Should repeated trials prove the advantage of the new method propoſed, we may venture to affirm, that it would be an improvement that would increaſe the national income in the agricultural branch many thouſand pounds annually; would add greatly to the perfection of the linen manufacture; and over and above, would ſuppreſs a very diſagreeable nuiſance, which the preſent method of watering flax occaſions during ſome part of the ſummer in every flax-growing country.

The intention of watering flax is, in my opinion, to make the boon more brittle or friable, and by ſoaking to diſſolve that gluey kind of ſap that makes the bark of plants and trees adhere in a ſmall degree to the woody part. The bark of flax is called the *harle*; and when ſeparated from the uſeleſs woody part the *boon*, this *harle* itſelf is called flax. To effect this ſeparation eaſily, the practice has long prevailed of ſoaking the flax in water, to a certain degree of fermentation, and afterwards drying it. For this ſoaking ſome prefer rivulets that have a ſmall current, and others ſtagnant water in ponds and lakes. In both methods the water acts as in all other caſes of infuſion and maceration; after two or three weeks it extracts a great many juices of a very ſtrong quality, which in ponds give the water an inky tinge, and offenſive ſmell; and in rivulets mix in the ſtream, and kill the fiſh. Nay, if this maceration be too long continued, the extracted and fermented ſap will compleatly kill the flax itſelf. For if, inſtead of two or three weeks, the new flax were to lie ſoaking in the water four or five months, I preſume it would be good for nothing but to be thrown upon the dunghill; both harle and boon would in that time be compleatly rotted; yet the harle or flax, when entirely freed from this ſap, and manufactured into linen, or into ropes, might lay many months under water without being much damaged; as linen, it may be waſhed and ſteeped in ſcalding water twenty times without loſing much of its ſtrength; and as paper, it acquires a kind of incorruptibility.

It appears then eſſential to the right management of new flax, to get rid of this pernicious vegetative ſap, and to macerate the boon; but from the complaints made againſt both the methods of watering now in uſe, there is reaſon to think that there is ſtill great room for improvement in that article. In rivulets, the vegetative ſap, as it is diſſolved, is carried off by the current, to the deſtruction of the fiſh. This prevents the flax from being ſtained; but the operation is tedious, and I have been told, often not compleat, from the uncertainty of knowing when it is juſt enough, and not too much, or perhaps from neglect. In ponds, the inky tinge of the water often ſerves as a kind of dye to the flax, which imbibes it ſo ſtrongly, that double the labour in bleaching will hardly bring the linen made of ſuch flax to an equality in whiteneſs with linen made of flax untinged. This ſeems to be equally unwiſe, as though we were to dye cotton black firſt, in order to whiten it afterwards. Theſe ponds beſides become a great nuiſance to the neighbourhood; the impregnated water is often of ſuch a pernicious quality, that cattle, however thirſty, will not drink of it; and the effluvia of it may perhaps be nearly as infectious as it is offenſive. If this effluvia be really attended with any contagious effects in our cold climates, a thing worth the enquiring into, how much more pernicious muſt its effects have been in the hot climate of Egypt, a country early noted for its great cultivation of flax.

I have often thought that the proceſs of watering might be greatly improved and ſhortened by plunging the new flax, after it is rippled, into ſcalding water, which, in regard to extracting the vegetative ſap, would do in five minutes more than cold water would do in a fortnight; or perhaps more than cold water could do at all, in reſpect to the clearing the plant of that ſap. Rough almonds, when thrown into ſcalding water, are blanched in an inſtant; but perhaps a fortnight's macerating thoſe almonds in cold water would not make them part ſo eaſily with their ſkins, which are the ſame to them, as the harle is to the flax. Were tea-leaves to be infuſed in cold water a fortnight, perhaps the tea produced by that infuſion would not be ſo good to the taſte, nor ſo ſtrongly tinged to the eye, as what is effected by ſcalding water in five minutes. By the ſame analogy, I think flax, or any ſmall twig, would be made to part with its bark much eaſier and quicker by being dipped in boiling water, than by being ſteeped in cold water. —This reflection opens a door for a great variety of new experiments in regard to flax. I would therefore recommend to gentlemen cultivators and farmers, to make repeated trials upon this new ſyſtem, which would ſoon aſcertain, whether it ought to be adopted in practice or rejected. One thing, I think, we may be certain of, that if the Egyptians watered their flax in our common manner, they undoubtedly watered it in *very warm water*, from the great heat of their climate, which would probably make them neglect to think of water heated by any other means than that of the ſun. A good general practice can only be eſtabliſhed upon repeated trials. Though one experiment may fail, another with a little variation may ſucceed; and the importance of the object deſired to be obtained will juſtify a good degree of perſeverance in the proſecution of the means. In this view, as the Chineſe thread is ſaid to be very ſtrong, it would be worth while to be acquainted with the practice of that diſtant nation, in regard to the rearing and manufacturing of flax, as well as with the methods uſed by the Flemings and the Dutch.

Boiling water, perhaps, might at once clear the new flax from many impurities, which, when not removed till it be ſpun into yarn, are then removed with difficulty, and with loſs of ſubſtance to the yarn. Why ſhould not the longitudinal fibres of the flax, before they are ſpun into yarn, be made not only as fine, but as clean as poſſible? Upon the new ſyſtem propoſed, the act of bleaching would begin immediately after the ripling of the flax; and a little done then might, perhaps, ſave much of what is generally done after the ſpinning and weaving. To ſpin dirty flax with a view of cleaning it afterwards, appears to be the ſame impropriety as though we were to reſerve part of the dreſſing given to leather till after it is made into a glove.

Should the plunging the flax into the boiling water not ſuffice to make the boon brittle enough, as I am inclined to think it would not, then the common watering might be added; but in that caſe, probably, half the time uſually given to this watering would ſuffice, and the flax might then be laid in clear rivulets without any apprehenſion of its infecting the water and poiſoning the fiſh, or of being diſcoloured itſelf; for the boiling water into which it had been previouſly put, would have extracted all the poiſonous vegetative ſap, which I preſume is what chiefly diſcolours the flax, and kills the fiſh.

On the ſuppoſition that the uſe of boiling water in the preparation of flax may be found to be advantageous and profitable, I can recollect at preſent but one objection againſt its being generally adopted. Every flax-grower, it may be ſaid, could not be expected to have conveniences for boiling water ſufficient for the purpoſe; the conſumption of water would be great; and ſome additional expence would be incurred. In anſwer to this I ſhall only obſerve, that I preſume any additional expence would be more than reimburſed by the better marketable price of the flax; for otherwiſe any new improvement, if it will not quit coſt, muſt be dropped, were it even the ſearching after gold. In a large cauldron a great deal of flax might be dipped in the ſame water, and the conſumption perhaps would not be more than a quart to each ſheaf; even a large houſhold pot would be capable of containing one ſheaf after another; and I believe the whole objection would be obviated, were the practice to prevail with us as in Flanders and Holland, that the flax-grower and the flax-dreſſer ſhould be two diſtinct profeſſions.

I ſhall conclude with recommending to thoſe who are inclined to make experiments, not to be diſcouraged by the failure of one or two trials. Perhaps the flax, inſtead of being juſt plunged into the ſcalding water, ought to be kept in it five minutes, perhaps a quarter of an hour, perhaps a whole hour. Should five minutes, or a quarter of an hour, or an hour, not be ſufficient to make the boon and harle eaſily ſeparate, it might perhaps be found expedient to boil the flax for more than an hour, and ſuch boiling when in this ſtate might in return ſave ſeveral hours boiling in the article of bleaching. It is not, I think, at all probable, that the boiling of the flax with the boon in it would prejudice the harle; for in the courſe of its future exiſtence it is made to be expoſed twenty or forty times to this boiling trial; and if not detrimental in the one caſe, it is to be preſumed it would not be detrimental in the other. Perhaps after the boiling, it would be proper to pile up the flax in one heap for a whole day, or half a day, to occaſion ſome fermentation, or perhaps immediately after the boiling it might be proper to waſh it with cold water. The great object when the flax is pulled, is to get the harle from the boon with as little loſs and damage as poſſible; and if this be accompliſhed in a more compleat manner than uſual, conſiderable labour and expence will be ſaved in the future manufacturing of the flax. On this account, I think, much more would be gained than loſt, were the two or three laſt inches of the roots of the ſtems to be chopped or clipped off previous to the flax being either watered or boiled. When the flax is watered, care ſhould be taken not to ſpread it out to dry, when there is a hazard of its being expoſed in its wet ſtate to froſt.

ARTICLE XXVII.

On Mangel-Wurzel.

[By the Rev. Mr. BROMWICH, to the Secretary.]

SIR,

DESIROUS to try the ſucceſs of the Mangel Wurzel in our climate, and whether, with us, it might merit thoſe high encomiums it has met with abroad, I was induced to make the following experiment to aſcertain its value. If you think the obſervations I have been hitherto able to make will be of the leaſt utility in promoting the cultivation of ſo beneficial a plant, I ſhall be happy in having communicated them to you.

I am, Sir,

Your moſt obedient humble ſervant,

BRYAN J'ANSON BROMWICH.

Cliff-Houſe, near Bridgnorth, Dec. 1, 1788.

Obſervations

Obſervations on the Cultivation of the Mangel Wurzel.

In the beginning of laſt April I prepared about a quarter of an acre of light ground, by forking it over, it having been left exceedingly foul and impoveriſhed by a former tenant. I mention this, as it will, together with the dry ſeaſon, in ſome meaſure account for the ſmallneſs of the roots; the largeſt not having exceeded ſix pounds in weight.

As ſoon as the land was cleaned, as well as ſo early a ſeaſon would admit of, I divided it into two equal parts; one half to be ſet with young plants from a ſeed bed, and the other part with ſeeds at half a yard diſtance from each other, in order to aſcertain the beſt of theſe two methods of planting. The laſt I find is much to be preferred, as the plants that were never tranſplanted, though late ſown, ſoon outgrew the others that were.

March 10th, the firſt ſeeds were ſown in the ſeed-bed, and tranſplanted into the field the 10th of May following; the roots having attained the thickneſs of a gooſe quill.

April 15th, one half of the ground in the field was ſown with ſeeds, being dropped at half a yard diſtance from each other, the ſame in which they were to remain, and put about an inch deep into the ſoil. Every ſeed commonly produces more than one plant, ſometimes three or four, ſo that it is neceſſary to draw up the ſmalleſt, about ten days after they appear above the ground, when ſown in this manner.

May 26th, the firſt crop of leaves was gathered, being then at their full growth, and more than a foot long, many m[illegible]ſuring eighteen inches. A freſh crop of leaves was conſtantly collected afterwards, every ten days or a fortnight, during the ſummer and autumn, until froſts ſomewhat retarded their vegetation. The laſt crop of leaves is not yet gathered.

The land, being very full of weeds and couch graſs, was obliged to be hoed three times during the ſummer, notwithſtanding the amazing luxuriancy of the plants, which covered all the ground; this foulneſs of the ground, together with the dryneſs of the firſt part of the ſeaſon, prevented the roots from gaining their uſual magnitude; none of mine having exceeded ſix pounds in weight.

The firſt attempt, in diſpoſing of the leaves, was to offer them to ſome milch cows, which fed upon them with great avidity, and even preferred them to clover, or any thing elſe that could be given them. Young calves were alſo very fond of the leaves, and would hardly touch any other food after they had eaten of them, except milk. Pigs, I believe, prefer them to any other vegetable that they are commonly fed with, and feed faſter with them than with potatoes. I do not find that horſes are fond either of the leaf or root; after repeated trials they will ſometimes eat a few leaves, but ſoon leave them for other food.

I have chiefly appropriated my crop of leaves to the feeding of pigs; and perhaps the following account of the actual profits I have made, will place the utility of this plant in a more obvious point of view, than by any other mode in which I could poſſibly expreſs myſelf.

Two cows were fed four weeks entirely with angel-wurzel leaves, and two calves eight weeks.

Sept. 18th, Sold four pigs at 1l. each, fed entirely with the leaves from the time they were eight weeks old.

Nov. 16th, Sold four pigs for 5l. 5s. fed with the leaves from the time they were weaned.

Beſides the above, upwards of twenty pigs, of all ſizes, have been conſtantly fed with theſe leaves, ſince the 26th of May till the preſent time. Moreover, in a quarter of an acre of ground, there are about 2400 plants; the average, therefore, at 4lb. per root, makes 9600 pounds weight of root for winter proviſion.

CALCULATION.

Debtor.	£.	s.	d.
To forking the land - - -	0	14	0
To hoeing - - - - -	0	4	0
To gathering the leaves - - -	1	0	0
To coſt of 8 pigs, at 8s. each - -	3	4	0
	£.5	2	0

Creditor.	£.	s.	d.
By keep of 2 cows four weeks, at 1s. each	0	8	0
By ditto, 2 calves 8 weeks, at 6d. each -	0	8	0
By ſale of 4 pigs - - - -	4	0	0
By ditto of ditto - - - -	5	5	0
By 20 pigs, kept 28 weeks, at 4d. each	9	6	8
By 9600lb. of roots for ſtore, at 6d. per 100lb. - - - - -	2	8	0
	21	15	8
	5	2	0
Profit	£.16	13	8

I hope the rates of feeding the different kinds of ſtock will at leaſt be deemed ſufficiently low: they are much too low for theſe parts.

However conſiderable the profit from the above calculation may appear, I am very certain the produce of the roots will be far above what I have expreſſed: I am convinced that the root will fatten any animal, that will eat it, much quicker than the root of the potatoe; but which I have eſtimated far below the value of that root by weight. If therefore the produce of the crop, ſo poor as mine, where the average would hardly admit of four pounds per root; the advantage of a good one, where they run from ten to twenty pounds weight, muſt be far ſuperior to any other vegetable I have the leaſt idea of.

I am happy to find that this plant, as the benevolent Doctor Lettſom ſuggeſts, may prove particularly uſeful to poor people; for, beſides the advantage ariſing from it, for culinary purpoſes, a very ſmall bit of land will enable them to keep a cow, or at leaſt a pig all the ſummer, which now few can do without being at more expence than the animal profits them.

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ARTICLE XXVIII.

Further Experiments on Mangel Wurzel.

[By the Same.]

Cliff-Houſe, near Bridgnorth,
SIR, *May* 25, 1789.

AS, from my former remarks on the culture and produce of the Mangel Wurzel, you wiſhed to be informed of my ſucceſs in regard to the roots; I have to mention, that they remained in the ground ſo late as the 16th of December, when one part was taken up, and after having the leaves cut off, the roots were piled up in a building, and covered with ſtraw, to preſerve them from the froſt. A part was left in the ground, in order to ſee if they would endure the ſeverity of our winters equally with the turnip; but as the froſt was ſo very intenſe, ſubſequent to the 16th, it was impoſſible to aſcertain that point, as both equally periſhed.

The greater part of the roots, when cut in pieces, was given to milch cows; and the butter at that time was eſteemed equal to the beſt, when produced from graſs. From this trifling experiment I could eaſily perceive two advantages this root has over the turnip; it feeds cattle much quicker, and communicates no offenſive taſte to the milk. The remainder of the roots were given to pigs; two were entirely fatted by them, and weighed about 260lb. each when killed.

I have this year ſowed more, and ſhould any thing occur in regard to the culture and management worth mentioning, I ſhall be happy to communicate it.

I am, Sir, your obedient ſervant,

BRYAN J'ANSON BROMWICH.

[☞ The ſeverity of the froſt in the winter of 1788 was uncommonly great, and therefore it cannot be ſurprizing that the roots of this luxuriant vegetable ſhould periſh in common with the turnip; but from other accounts which we have received, we may conceive a hope that the Mangel Wurzel, in a dry and healthy ſoil, is capable of reſiſting the influence of common degrees of froſt, and that though the accounts of its excellence, as food for cattle in general, are not numerous, it will yet be found valuable for that purpoſe in many ſituations. We eſteem ourſelves much obliged to Mr. Bromwich for his account of experiments conducted with ſo much care and preciſion: and if the plant in queſtion ſhall be found but half as profitable in general for feeding pigs, as it appears to have been to him, it will ultimately rank among crops of conſequence to the farmer.]

ARTICLE XXIX.

An Account of an Experiment made in the Year 1788, *in raiſing of the Mangel-Wurzel.*

[By JAMES BERNARD, eſq; of Crowcombe.]

IN the beginning of the year 1788, Dr. Lettſom, through the intervention of a friend, gave me 67 ſeeds of the Mangel-Wurzel, which I ſowed in the hot-bed the latter end of March 1788, and they all came up in about eight or nine days. On the 14th of May ſixty ſix of the plants were tranſplanted into a common bed in my kitchen garden: the bed was 23 feet long and 5 feet wide, the plants were placed about 17 inches apart every way from each other, the outer plants being placed near the edge of the bed. On the 13th or 14th of June, in the midſt of that remarkably dry and hot weather, they were all well hoed and cleared of all weeds; the plants grew vigorouſly, and upon the firſt rain ſhot out their leaves ſo ſtrong as entirely to cover the ground, and prevented any weeds from growing afterwards.

In the beginning of Auguſt I took up one of the plants of about 3½lb. weight, by way of taſte and trial, and had the leaves and root boiled. The taſte of the leaves was ſo much like ſpinach I could ſcarcely have known it from that vegetable; the root had a ſweet and rather earthy taſte, ſomewhat like the beet, but not ſo earthy; it was more like a turnip boiled with ſugar, and was far from being a pleaſant food to my palate, though certainly very eatable. From its ſweetneſs I ſhould ſuppoſe a ſaccharine juice might be produced, from whence by diſtillation a ſpirit might be extracted, and poſſibly ſuperior to what has been drawn from potatoes.

The plants were afterwards ſuffered to remain till the 18th of November 1788, when the remaining ſixty-five plants were taken up, in order to be carefully put aſide to be replanted again next ſpring for ſeed. I had them weighed, the leaves by themſelves and the roots by themſelves, and the weight of the whole crop was as follows:

	Pounds.
The leaves and tops of the 65 plants weighed -	202
The roots weighed - - - - - -	340½
Total weight	542½
The corner plant, which had more ſpace to extend its roots and branches in, was ſo large that I was induced to weigh it by itſelf, and I found the leaves weighed - - - - -	6½
The root - - - - - -	15½
Total -	22

This circumſtance convinces me that I planted them too near each other, otherwiſe my crop would have been much larger; but as it is, ſurely it is no inconſiderable produce from ſo ſmall a piece of ground.

Whether this plant will be a pleaſant and nutritive food for cattle I cannot at preſent ſay, having yet made no fair trial of it. I gave ſome of the leaves of it to my cows, but they declined eating it; it was hardly a fair trial, as the cows were juſt brought home to be milked, out of a very fine rich meadow, where there was plenty of graſs and very ſweet herbage, and their bellies were full. The pigs ate it voraciouſly.

On the 19th of January 1789, I weighed the roots again, and then they weighed only 298lb. having loſt 42½lb. ſince they were taken out of the ground; but this loſs of weight is not ſo very extraordinary, when we conſider the juicineſs and ſucculency of the roots when taken up, and the dry and froſty weather we have had ever ſince, and that they were kept in a dry chamber, covered with ſtraw to preſerve them from the inclemency of the weather. They were apparently much drier, but were ſound and in good preſervation, and no ways injured by the froſt.

I alſo planted one other plant (the ſixty-ſeventh) by itſelf in the garden, by way of trial how it would ſtand the winter; I left it entirely uncovered and unprotected from all the ſevere weather we have lately experienced, and I do not find that, in ſpite of the ſevereſt trial it can well be ſuppoſed ever to have in this country, it is the leaſt hurt, the main ſhoot and crown of the plant look vigorous and healthy: many of the leaves, indeed, are dropped down, but not much more than ſpinach or other common greens are. What this plant weighs I cannot tell, it having never been taken up, but in appearance it ſeems to be almoſt as big as the largeſt of the plants that grew in the bed.

ARTICLE XXX.

On Bees.

[In a Letter to the Society.]

GENTLEMEN,

SOME time ſince, ſeeing your advertiſement of propoſed premiums for encouraging the improvement of bees, a few hints from an old experimenter on theſe uſeful inſects may, perhaps, contribute to the furtherance of your laudable deſign.

Premiums for the greateſt number of ſtocks ſeem very liable to cauſe impoſitions. I know the London Society ſuffered ſuch. It is very eaſy for deſigning perſons to purchaſe or procure the loan of ſtocks, from a diſtance, and therewith to augment their own apiaries, previous to the time of inſpection; nor will it often happen, that the ſigners of their certificates will trouble themſelves to make the neceſſary inveſtigation. Be that as it may, the excitement will influence but few candidates, and not produce ſuch a general emulation among the apiarian farmers, &c. as might be wiſhed. Beſide, England is not defective in the production of ſwarms: Our ſtocks in general emit too many, which make a great ſhew in number, but yield a very inadequate proportion of honey and wax, or of ſtocks fit to ſtand through the winter and ſpring. It is certain we have more farina to nouriſh the broods, than honey to feed them when bred: conſequently there are but few apiaries but what may be overcharged. At this place eight ſtocks is the moſt we can keep with propriety. At Cheſhunt in Hertfordſhire, (my late reſidence) 12 or 14 were the utmoſt. If none but firſt good ſwarms were preſerved, and the caſts or after-ſwarms returned back to the ſtocks, the increaſe of honey would be many fold greater than in the uſual practice of the peaſantry. An incorporated ſtock will gather more honey than three or four ſingle ones, for reaſons obvious to intelligent apiators.

Hives of bees of half a buſhel meaſure, intended to ſtand, ought at *leaſt* to weigh twenty pounds; larger hives in proportion. Nor ought they to be *above* two years old. Probably, if the number of ſtocks in one perſon's poſſeſſion in January or February were to intitle to the premium, a deception might be more difficult.

To take the honey without deſtroying the bees, cannot be done by any of the preſent methods, without trouble, and other inſtruments than are yet publickly known or in uſe among the commonality; conſequently the peaſantry (from whom we muſt look for a general increaſe) have neither attempted, nor will attempt a change, where an additional expence is certain, againſt an uncertain advantage: a few perſons of higher ſtation may make a point of pride or intereſt in benefiting by the premium, whilſt the generality will ſtill remain ignorant and incapable. It is with concern I ſee numbers of ſober, honeſt, and induſtrious cottagers, with families, to whom a ſtock of bees would be a little eſtate, but who out of their ſmall pittance of wages (as here 4s. a week) can never ſpare enough to

purchaſe

purchaſe ſo deſirable a reſource. A preſent of a ſtock to *perſons of ſuch characters*, under injunctions of managing them agreeably to the beſt known methods, might often prove very ſerviceable, greatly tend to the increaſe of the article, and would be a ſpecies of benevolence and patriotiſm worthy of opulent individuals and publick ſocieties.

It is much to be lamented as a national loſs, that great part of the prime ſwarms are ſuffered to eſcape, from an erroneous opinion about ſigns and hours of ſwarming; whereas nothing leſs than a *conſtant* watching, from ſeven to four, can prevent this loſs; but which the peaſantry will not comply with. For unleſs we can find a more ſafe, eaſy, cheap, and effectual method of ſwarming bees ARTIFICIALLY, the old practice will prevail. I have been experimenting on bees near thirty years, but cannot fully accompliſh theſe grand points; the ſuperior genius of theſe diminutive artizans baffle the moſt laboured ſchemes of an old veteran. However, as they ſtill continue my principal amuſement, I ſhall perſevere until I accompliſh my deſign, or the imbecilities of advanced age render me incapable.

A few years ſince Earl Marchmont honoured me with a preſent of the celebrated *Schirach*'s Treatiſe on Bees, which produced ſo much altercation among the naturaliſts, and apiarian ſocieties in Germany. I have likewiſe been favoured by T. Dilks, eſq; and Lord Torrington, with the principal Memoirs on Bees of the Bruxelles Academy, &c. From theſe I hoped to have drawn great advantage; but after ſeveral years reiterated experiments thereon, to the deſtruction of many bees, I find them futile, and without *one ſingle reſult* conſonant to, or in favour of, their new doctrines. They may *amuſe* the curious, but are of no advantage to publick practice.

As honey is diſagreeable, nay hurtful to many conſtitutions, perhaps it might be worth a trial to procure ſome honey to be refined as ſugar. Melaſſes are the groſs oily parts of ſugar, and being extracted therefrom, it is rendered more wholeſome and palatable; if therefore an experiment were made on honey, by a ſuitable proceſs, it might probably improve both its dietetic and medicinal qualities, adapting it more to general uſe.

I am, Gentlemen,

Your moſt humble ſervant,

Near Pembroke, JOHN KEYS.
June 1788.

ARTICLE XXXI.

On Bees.

[By the Same, to the Secretary.]

SIR,

IN conſequence of your favourable reception, and polite anſwer, to the letter I ventured to addreſs to the Society laſt year, I am led to offer the annexed *Caution*, to be inſerted in the next volume of the Society's papers, if deemed worthy of ſuch diſtinction. That it will be conducive to the general benefit of bee-keepers, I am fully and practically perſuaded, and I ſubmit to the conſideration of the Society, the previous ſteps of cauſing it to be inſerted, under their ſanction, in the country newspapers. If the Bath Society ſhall incline to give my ſentiments their ſanction, it will give a weight and dignity to the ſubject, far ſuperior to the influence of an obſcure individual, whoſe recommendation would be but ſlightly regarded.

The beſt time to inſert ſuch an advertiſement, will be about the middle of March; as then the bees begin to work briſkly, and thereby the notice of their owners would be engaged.

The loſs of the *prime* ſwarms, which is ſo common, is in my opinion of greater conſequence in the culture of bees, than even that impolitic practice of ſuffocation, which I have *lately* found reaſon to think not ſo very detrimental to the publick intereſt, as has been imagined.

If the Society ſhould adopt any of my hints, I ſhall be thankful for a line of communication, or from any member, or experimenter in the apiarian art.

From a treatiſe which I mentioned in my former letter, *Schirach on the Queen Bee*,* I hoped to have derived much information, as ſeeming to promiſe the moſt eſſential ſervice; unhappily I have been totally diſappointed. He affirms, that all the working bees of a hive are females in diſguiſe; and that every one of theſe bees, in an early ſtate of their exiſtence, was capable of becoming a queen: from a knowledge of which, ſwarms may *artificially* be obtained from the early months of ſpring, and in any ſucceeding month, even to November. His experiments have been very numerous; and to obviate every doubt and objection, he performed the operation upon *one, and the ſame ſtock*, every four days, for at leaſt *fifty* or *ſixty* times; all which pro-

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* Paſtor of Klein-Bautzen, in Upper-Luſatia, and Secretary to a Society of Naturaliſts there.

duced

duced young queens, from mere fragments of the combs, &c. &c. This novel and wonderful doctrine excited no little contention and counter-experimenting among naturaliſts on the continent, without being decided even by the great *Bonnet.* For eight years have I alſo, with great attention and minuteneſs, endeavoured to ſucceed, by *Schirachian* rules; but in the many eſſays and variations, I never once found ſuch a reſult as *Schirach* deſcribes. He *aſſerts*, (which is indeed the grand proof) that the *practice* of this art has already extended itſelf through Upper Luſatia, the Palatinate, Bohemia, Bavaria, Sileſia, and ſeveral other parts of Germany, and even of Poland. And yet, ſurprizing as it may ſeem, in Britain we have made no ſuch ſimilar improvement, at leaſt, that has come under my notice.

I would not ceaſe purſuing the experiment, were I certain of the above fact, and that thereby a larger quantity of honey and wax has been obtained than by the uſual methods before practiſed in thoſe countries: for a greater number of ſtocks *only* will not be concluſive. It is the real profit, and not the ſhew, that we look for.

My humble requeſt, therefore, to the Society is, that if they have formed, or can form a correſpondence in thoſe parts, to obtain a ſatisfactory inveſtigation of the above points, and will communicate them to me, it will be eſteemed as high a favour, and gratefully acknowledged; and, I hope, be converted to the publick benefit.

I am, Sir,

Your very humble ſervant,

JOHN KEYS.

Near Pembroke, Feb. 6, 1790.

A Caution to the Owners of Bees.

IT is a prevailing and general opinion, that bees never *ſwarm* without *firſt*, ſhewing ſome previous ſigns or tokens; and that they ſeldom ſwarm until about the middle of the day. Thoſe who keep bees in the duplicate manner, by ſetting one hive or box over another, are miſled by the writers on bees to believe, that by ſuch kind of contrivance, they are prevented from ſwarming at all. Both which opinions are aſſuredly ill-founded. I take upon me to aſſert, that *one third* of the prime or *firſt ſwarms eſcape* unperceived; and that, generally, without the leaſt indication of their deſign.

The ſeaſons and hours of ſwarming are alſo much miſtaken: they ſometimes ſwarm in March, frequently in April, and from ſeven in the morning till four in the evening; many riſe ſo early and ſo late. Nor will a tranſient viewing of them now and then ſuffice; one minute ſhall preſent no appearance of ſwarming, and in the next they ſhall ſuddenly iſſue, and fly quite away. Thoſe that are duplicated are equally as prone as thoſe in ſingle ſtraw hives; for *all* will equally purſue great Nature's law, *to ſwarm*. Without, therefore, a bee-herd, or perſon appointed for *conſtant watching*, not caſually, but without intermiſſion, from ſeven till four, the proprietor will have his expectations, in a great meaſure, diſappointed. A child or aged perſon may be hired for the purpoſe, at the eaſy charge of 2d. or 3d. a day, whereby, if only *one* ſwarm be preſerved, it will prove an adequate compenſation for the expence; beſides being ſure of loſing none of the reſt, and the preventing a great deal of anxiety, and often a very fruitleſs trouble to thoſe who keep four ſtocks, or more.

From many years aſſiduous obſervation, and numberleſs experiments, I may ſafely ſtake my credit upon the truth of my aſſertions.

Feb. 6, 1790. JOHN KEYS.

ARTICLE

ARTICLE XXXII.

On Cyder-Wine, made from the Juice of Apples, taken from the Preſs and boiled, according to Recipe of Dr. Ruſh.

[By ROBERT STEVENS, eſq; to the Secretary.]

Ansford near Caſtle-Cary,
SIR, *Aug.* 11, 1789.

WITH the greateſt readineſs I comply with the requeſt of your Committee, and ſhall ſend, next Saturday, a two-gallon caſk of Cyder-Wine, drawn from a hogſhead I had made under my own inſpection, as a trial of the liquor recommended in the Bath Chronicle. I am ſorry to obſerve the directions there given were too ſcanty, as very little more was ſaid, than that two hogſheads of cyder from the preſs ſhould be boiled down to one, and kept till fit for uſe, and that in three or four years, according to Doctor Ruſh's opinion, it would become a pleaſant liquor, not unlike Rheniſh. The boiling the juice of the apple I conceived could not be all that was neceſſary to make a vinous liquid—fermentation muſt ſomehow be procured, and obſervation and experience muſt determine how far that fermentation ſhould be carried. I am certain there is yet much to learn in that particular, and upon that principally the goodneſs of the liquor muſt depend. As I have very little doubt, ſhould the analyſis intended correſpond with the few experiments I have made, but a very wholeſome and palatable liquor, approaching to wine, may be obtained from the apple; I ſubmit it to the conſideration of your Society how far it may be neceſſary to offer a ſmall honorary premium, or a pecuniary reward, for the greateſt number of experiments to aſcertain the beſt manner of making this wine, and for the beſt wine produced to a Committee, in a given time. The extraordinary conſumption of ſpirituous liquors, every friend to mankind muſt lament; and it is a melancholy obſervation, that the increaſe of the national revenue is purchaſed at the expence of the health of ſo great a part of the community. This evil, I am afraid, can never be totally removed; but I conceive it may be meliorated by the introduction of other cheap and more healthful liquor; at leaſt it may be expected the middling claſs of people, and thoſe capable of reflection, may be thereby induced to relinquiſh the uſe of ſlow, yet certain poiſon.

It may not be unneceſſary to mention, that in the making I took particular care as to the cleanneſs of the copper the apple-juice was boiled in, and which I had immediately from the preſs.—As ſoon as this juice was reduced to ſomewhat leſs than one hogſhead, the liquor was immediately taken out of the copper, and cooled in wooden coolers. When it retained that degree of heat only, in which beer is uſually worked, ſuch a quantity of yeaſt was put in as I imagined would bring on a tolerably briſk fermentation—it fermented pretty ſtrongly during the night following, and the next morning a thick yeaſty froth covered the top of the maſh-tub in which it was put—the fermentation ſubſided towards the evening, and, if I recollect, was rather in a negative ſtate the whole day. I think, had the fermentation continued longer, I ſhould have made a more wine-like liquor, that would not have retained ſo much of the *baked apple-pie taſte*, which you will perceive it has, and which it will require ſome years keeping (if it will bear it) to get rid of.

This year, if I have apples ſufficient, I ſhall make ſome freſh trials, and ſhall endeavour at a more perfect fermentation.—Should I have any ſucceſs, or imagine any thing I may then have done can be ſerviceable to others, I ſhall do myſelf the pleaſure to communicate to your Society all the information I am capable of giving.

I am, Sir, your moſt obedient ſervant,

ROBERT STEVENS.

[For the laudable endeavours of Mr. *Stevens* to aſcertain the important point which had excited his attention, and for his polite manner of addreſſing the Bath Society, the thanks of a General Meeting were voted to him.—Several Members of the Society were requeſted to take ſamples of the liquor ſent—make experiments upon it, and report their opinion of its wholeſomeneſs—as alſo on the Nature and Effects of Cyder, as commonly made and uſed.—The following paper being preſented to the Society, in conſequence, by Dr. *Anthony Fothergill*, is here inſerted.]

ARTICLE XXXIII.

Experiments and Obſervations on Cyder-Wine, with Remarks on Fruit Liquors, and Hints for their Improvement.

[By A. FOTHERGILL, M. D. F. R. S. Bath.]

> Vinum tot veneficiis placere cogitur;
> Et miramur noxium eſſe.
>
> PLIN. lib. 14.

PURSUANT to the Society's requeſt, I have examined the cyder-wine prepared after the method communicated by Dr. Ruſh, as practiſed in America, viz. by evaporating in a brewing *copper* the freſh apple-juice till half of it be conſumed. The remainder is then *immediately* conveyed into a wooden cooler, and afterwards is put into a proper caſk, with an addition of yeaſt, and fermented in the ordinary way. The proceſs is evidently borrowed from what has long been practiſed on the recent juice of the grape, under the term of *vin cuit*, or boiled wine, not only in Italy, but alſo in the iſlands of the Archipelago, from time immemorial.

It has lately become an object of imitation in the cyder countries, and particularly in the Weſt of England, where it is reported many hundred hogſheads of this wine have already been made; and as it is ſaid to betray no ſign of an impregnation of copper by the uſual chemical teſts, it is conſidered as perfectly wholeſome, and is accordingly drunk without apprehenſion by the common people; others, however, ſuſpect its innocence. It therefore becomes an object of no ſmall moment to determine, in ſo doubtful a matter, whether the liquor acquires any noxious quality from the copper in which it is boiled, or not.

The wine ſent for my examination was of a red colour, ſomewhat turbid, and of a ſweetiſh empyreumatic taſte, reſembling that of a roaſted pippin —properties by no means deſirable in a vinous liquor, but which doubtleſs may be conſiderably meliorated by keeping to a proper age.

EXPERIMENTS.

Exp. 1. Volatile Alcali. Into a ſmall glaſs of cyder-wine were dropped fifteen drops of volatile ſpirit of ſal ammoniac.—A ſlight precipitation enſued, the liquor became *darker* coloured, and on ſtanding, a thick cloud of a *greeniſh* caſt ſettled on the ſurface. The volatile alcali, whether *mild* or *cauſtic*, exhibited the *ſame* appearance.

Exp. 2. Phlogisticated Alcali. The like proportion of the phlogiſticated alcali gave a more viſible *green* tinge to the liquor, and on ſtanding produced a variegated *film* on the ſurface, reflecting the priſmatic colours, ſimilar to what is obſerved in chalybeate waters expoſed to the air. At the *bottom* were ſome particles of a *brown* caſt.

Exp. 3. Solution of Orpiment. This liquor which is prepared by chemiſts under the term of *Liquor vini probatorius*, or *wine teſt*, when dropped into the cyder-wine, occaſioned a ſlight *cloudineſs*, followed by a precipitation of *browniſh* particles.

Exp. 4. A freſh portion of cyder-wine being diluted with three times its quantity of fair water, was afterwards tried with the above-mentioned liquors, and then exhibited the different phœnomena *more* diſtinctly.

Exp. 5. A bottle of my own cyder, ſent me from a friend in Devonſhire as *genuine*, was now ſubjected to the above chemical teſts, that the reſult might be compared. It however underwent no *material* change, except from the phlogiſticated alcali, which gave a faint greeniſh tinge, but *no* viſible *precipitation*.

Exp. 6. POLISHED IRON. A knife-blade being immerſed a few hours in a glaſs of cyder-wine, when dried exhibited a *blackiſh brown* mark, interſperſed with ſhades of a *copper* colour. The wine at the ſame time aſſumed a darker hue, from a ſlight impregnation of the iron.

Exp. 7. SOLUTION OF VITRIOL OF COPPER—being dropped on the poliſhed part of the blade, when dried gave a ſimilar mark, but of a *brighter* brown.

Exp. 8. RESIDUUM. A pint of cyder-wine being evaporated in a tin veſſel to a thick extract, was next placed in a crucible, and, with an addition of tallow, was calcined to a black powder. This *reſiduum* was examined, and as no metallic particles appeared, a pint of ſpring water was poured upon it, and after it had ſtood all night to ſubſide, it was decanted into three ſeparate glaſſes.

Into the firſt was dropped ſome *volatile alcali*; into the ſecond *phlogiſticated alkali*; and into the third the *wine teſt*.

Slight marks of precipitation were barely perceptible in all the glaſſes, but the dark turbid appearance of the mixture concealed the changes of colour, as it did in ſome meaſure in two of the preceding experiments, ſo as to render the reſult rather *equivocal*, though they were repeated more than once.

Being curious to know whether the ſame phœnomena would ſtrike other obſervers in a ſimilar way, I ſent a bottle of the cyder-wine to my ingenious friend Dr. *Johnſtone* of Worceſter, for his examination. His ſon ſoon after favoured me with the following letter, containing the reſult of his experiments, which I have the ſatisfaction to find agree very nearly with my own.

"SIR, *Worceſter*, *Sept.* 23.

"I am deſired by my father to acquaint you with the reſult of ſome experiments which I have made on the cyder-wine. By them it appears to be *conſiderably* impregnated with copper.

"I have the honour to be, Sir,

"Your obedient humble ſervant,

"JOHN JOHNSTONE."

Experiments.

" 1. A ſteel pin put into the cyder-wine became of a *brown* colour, which left on the tongue the nauſeous aſtringent taſte of *copper*, at the ſame time the wine became of a darker colour, from ſome portion of iron diſſolved in it.

" 2. Sal volatile mixed with the cyder-wine made it of a *dark* turbid colour; it occaſioned in white-wine a kind of cloud ſimilar to that ſometimes obſerved in urine.

" 3. Phlogiſticated alkali precipitated a dark *brown* cloud very copiouſly; it had no effect on common white-wine; a clear proof of the preſence of *copper* in the cyder-wine.

" 4. A ſteel pin put into cyder-wine in which a precipitation had been made by ſal volatile, was *not at all* incruſted, nor was its colour in the leaſt changed, though it remained in the wine more than twelve hours."

Thus far my correſpondent.

OBSERVATIONS.

Though a ſingle grain of copper diſſolved in upwards of twenty gallons of clear water may be detected by a viſible blue tinge appearing on the addition of a few drops of volatile alcali, yet this is by no means the caſe in turbid high-coloured liquors, which intercept the rays of light, and often occaſion a conſiderable *deception* in the appearances. Hence the neceſſity of diluting ſuch liquors in varying the experiments. In no inſtance did the blue tinge appear with the alcalies, even after the wine was diluted, and yet its abſence does *not* prove the liquor to be abſolutely *free* from an impregnation of copper. For I afterwards found that it required from three to five drops of a ſolution of vitriol of copper to give a viſible blue tinge to a glaſs of the liquor. The alcalies gave a greeniſh tinge to the wine; and copper, in form of verdegris, aſſumes indifferently a green or blue colour, according to circumſtances.

If the mark on poliſhed iron was darker than that which is produced by vitriol of copper, it was evidently owing to a ſmall portion of the *iron* diſſolved at the ſame time, and which always imparts a *blackiſh* tinge to poliſhed metals.

If the liquor was free from any metallick impregnation, why did it yield a *precipitation?*—a *variegated film?*—a *brown ſediment?* And why did it afford ſuch a ſtriking contraſt, when compared with genuine cyder, or white-wine?

When the metallick principle was precipitated by an alcali, the wine *no* longer gave the brown *coppery* tinge to the ſteel pin, and that for an obvious reaſon. Copper unites with an alcali rather than with iron.

On the whole, if we may rely on the above experiments, does not the general reſult afford a ſtrong preſumption, if not a proof, that the cyder-wine contains a minute impregnation of copper? Not ſo *conſiderable*, nor yet ſo very *palpable*, (it is to be hoped) as my ingenious correſpondent ſeems to imagine, but yet ſufficient to put the publick on their guard concerning a liquor that comes in ſo very '*queſtionable a ſhape.*'

It is a curious chemical fact, if it be really true, that acid liquors, while kept *boiling* in copper veſſels, acquire little or *no* impregnation from the metal, but preſently begin to act upon it when left to ſtand in the *cold*. Can this be owing to the agitation occaſioned by boiling, or the expulſion of the aërial acid? Atmoſpherick air powerfully corrodes copper, probably through the intervention of the aërial, or rather nitrous acid, for both are now acknowledged to be preſent in the atmoſphere. But

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the latter is doubtleſs a much ſtronger menſtruum of copper than the former.

In the preſent proceſs, the liquor is properly directed to be paſſed into a *wooden cooler*, as ſoon as the boiling is completed. But as all acids, and even common water, acquire an *impregnation, and unpleaſant taſte, from ſtanding in copper veſſels in the cold, why may not the acid juice of apples act* in ſome degree on the copper *before* the boiling commences? Add to this, that brewing coppers, without far more care and attention than is generally beſtowed on them in keeping them clean, are extremely apt to contract verdegris, (a rank poiſon) as appears from the blue or green ſtreaks very viſible when theſe veſſels are minutely examined. Should the unfermented juice be thought incapable of acting on the copper, either in a cold or boiling ſtate, yet no one will venture to deny its power of waſhing off, or diſſolving verdegris *already formed* on the internal ſurface of the veſſel. Suppoſe only one-eighth part of a grain of verdegris to be contained in a bottle of this wine, a quantity that may elude the ordinary teſts, (for reaſons already aſſigned) and that a bottle ſhould be drunk daily by a perſon without producing any violent ſymptom, or internal uneaſineſs, yet what perſon in his ſenſes would knowingly chuſe to hazard the experiment of determining how long he could continue even this quantity of a ſlow poiſon in his daily beverage, with impunity? And yet it is to be feared the experiment is but too often unthinkingly made, not only with cyder-wine, but alſo with many of the *foreign* wines prepared by a ſimilar proceſs. For the grape juice, when evaporated in a copper veſſel, under the denomination of *vino cotto*, or boiled wine, cannot but acquire an equal, if not yet ſtronger impregnation of the metal than the juice of apples, ſeeing that verdegris itſelf is manufactured merely by the application of the acid huſks of grapes to plates of copper.

Independent of the danger of any metallick impregnation, it may be juſtly queſtioned how far the proceſs of preparing boiled wines is neceſſary, or reconcileable to reaſon, or œconomy.

The evaporation of the *muſt* by long boiling not only occaſions an unneceſſary waſte of both liquor and fuel, but alſo diſſipates certain *eſſential* principles, without which the liquor can never undergo a complete fermentation, and without a complete fermentation there can be no perfect wine. Hence the boiled wines are generally crude, heavy and flat, liable to produce indigeſtion, flatulency, and diarrhœa. If the evaporation be performed *haſtily*,

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the liquor contracts a burnt empyreumatick taſte, as in the preſent inſtance; if *ſlowly*, the greater is the danger of a metallick impregnation. For the proceſs may be preſumed to be generally performed in a veſſel of braſs, or copper, as few families poſſeſs any other that is ſufficiently capacious. Nor can a veſſel of caſt-iron, though perfectly ſafe, be properly recommended for this purpoſe, as it would probably communicate a chalybeate taſte, and dark colour to the liquor. At all events braſs and copper veſſels ought to be entirely baniſhed from this and every other culinary proceſs. The miſchievous conſequences reſulting from metallick poiſons, and particularly of lead and copper, are, I am convinced, more numerous and extenſive than is commonly imagined. The evil has long been loudly complained of, and yet the people of this country continue to ſacrifice their health, and lives, to the moſt unpardonable negligence and ſupineneſs, even when the remedy is at hand. But I ſhall reſerve my ſtrictures on this ſubject for a future paper.

Remarks on CYDER *and* PERRY.

Before I conclude, it may not be improper to add a few obſervations on the preſent ſtate of fruit liquors in our cyder counties, the improvement of which is an object of great importance to the publick,

lick, but particularly ſo to the inhabitants of thoſe diſtricts where theſe liquors conſtitute their common beverage. Cyder and perry, when genuine, and in high perfection, are excellent vinous liquors, and are certainly far more wholeſome than many others which at preſent are in much higher eſtimation.

When the *muſt* is prepared from the choiceſt fruit, and undergoes the *exact* degree of vinous fermentation requiſite to its perfection, the acid and the ſweet are ſo admirably blended with the aqueous, oily, and ſpirituous principles, and the whole imbued with the grateful flavour of the rinds, and the agreeable aromatick bitter of the kernels, it aſſumes a new character; grows lively, ſparkling, and exhilarating; and when compleatly mellowed by time, the liquor becomes at once highly delicious to the palate, and congenial to the conſtitution. Superior in every reſpect to moſt other Engliſh wines, and perhaps not inferior to many of the beſt foreign wines.

Such I can venture to affirm would it be pronounced by all competent judges, were it not for the popular prejudice annexed to it as a cheap, home-brewed liquor, and conſequently within the reach of the vulgar. To compare ſuch a liquor with the foreign fiery, ſophiſticated mixtures, often imported under the name of wines, would be to degrade it; for it certainly ſurpaſſes them in flavour and pleaſantneſs, as much as it excels them in wholeſomeneſs and cheapneſs. But rarely do we meet with perry or cyder of this ſuperior quality. For what is generally ſold by dealers and innkeepers is a poor, meagre, vapid liquor, prone to the acetous fermentation, and of courſe very injurious to the conſtitution. *Is it not very mortifying, after the experience of ſo many centuries, that the art of preparing theſe ancient Britiſh liquors ſhould ſtill be ſo imperfectly underſtood as yet to ſeem to be in its very infancy;—that throughout the principal cyder diſtricts, the practice ſhould ſtill reſt on the moſt vague, indeterminate principles, and that the excellence of the liquor ſhould depend rather on a lucky random hit, than on good management?* Yet ſuch appears to be really the caſe even among the moſt experienced cyder-makers of Herefordſhire and Glouceſterſhire!

Mr. Marſhall, that nice obſerver of rural affairs, in his late Tour through thoſe counties* (expreſsly undertaken for the purpoſe of inquiry on this ſubject) informs us, that ſcarcely two of theſe profeſſional artiſts are agreed as to the management of ſome of the moſt eſſential parts of the proceſs. That palpable errors are committed as to the time and manner of gathering the fruit—in laying it up —in neglecting to ſeparate the unſound—and to grind properly the rinds and kernels, &c. That the method of conducting the vinous fermentation, the moſt *critical* part of the operation, and which ſtamps the future value of the liquor, is by no means aſcertained. While ſome promote the fermentation in a ſpacious open vat, others repreſs it by incloſing the liquor in a hogſhead, or ſtrive to prevent it altogether. That no determinate point of temperature is regarded, and that the uſe of the thermometer is unknown, or neglected.—That they are as little conſiſtent as to the time of racking off, and whether this ought to be done only once, or five or ſix times repeated. And that for fining down the liquor, many have recourſe to that odious article, bullock's blood, when the intention might be much better anſwered by whites of eggs, or iſinglaſs. And finally, that the capricious taſte of particular cuſtomers is generally conſulted, rather than the real excellence of the fruit wine, and conſequently that a very imperfect liquor is often vended, which tends to reduce the price, to diſgrace the vender, and to bring the uſe of cyder and perry into diſrepute.

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* Marſhall's Rural Œconomy of Glouceſterſhire, ii. 308 & ſeq.

The art of making vinous liquors is a curious chemical proceſs, and its ſucceſs chiefly depends on a *dexterous* management of the vinous fermentation, beſides a cloſe attention to ſundry minute circumſtances, the theory of which is perhaps not yet fully underſtood by the ableſt chemiſts. Can we *longer wonder then that ſo many errors ſhould be* committed by illiterate cyder-makers, totally unverſed in the firſt principles of the chemical art? Some few indeed, more enlightened than their brethren, and leſs bigoted to their own opinions, by dint of obſervation, ſtrike out improvements, and produce, every now and then, a liquor of ſuperior quality, though perhaps far ſhort of excellence; yet ſtill ſufficient to ſhew what might poſſibly be accompliſhed by a ſeries of new experiments conducted on philoſophical principles.

This might lead to ſucceſſive improvements, till at length our Engliſh fruit liquors might be carried to a pitch of perfection hitherto unknown, by which the demand, both at home and abroad, would ſoon be enlarged, the prices augmented according to the quality, the value of eſtates increaſed, and the health and proſperity of theſe counties proportionably advanced.

This might alſo help to point out a method of correcting the imperfections of theſe liquors; and of meliorating thoſe of a weak, meagre quality, by ſafer and more effectual means than are now practiſed: and though nothing can fully compenſate the defect of ſun-ſhine in maturing the ſaccharine juices, in unfavourable ſeaſons, yet probably ſuch liquor might, without the dangerous and expenſive method of boiling in a copper veſſel, admit of conſiderable improvement by the addition of barm or other ſuitable ferment, as yet unknown in the practice of the cyder diſtricts; or perhaps rather by a portion of rich *muſt*, or ſome wholeſome ſweet, as honey, ſugar-candy, or even melaſſes, added in due proportion, previous to the fermentation.*

Now, ſhould this Society intereſt themſelves in the preſent inquiry, in which this and the adjacent counties are materially concerned, might it not be adviſeable to offer a ſuitable premium to ſtimulate the cyder-makers to undertake ſuch a courſe of experiments as may ſeem proper towards the improvement of perry and cyder, and alſo for correcting, or meliorating theſe liquors when prepared from an unripe or inferior fruit?

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* Since the above was written, I learn from a recent publication, that the Germans are known to meliorate their thin harſh wines by an addition of concentrated Muſt, not by evaporation, but by *freezing*. By this ſimple proceſs they are made to emulate good French wines—a practice worthy imitation, eſpecially in the Northern climates.

See HOPSON's Chemiſtry.

It is greatly to be regretted that the capital old fruits, which raiſed the fame of the liquors of this country, are now chiefly loſt, or ſo far on the decline, as to be deemed irrecoverable.

Mr. Marſhall, in his late ſurvey of the orchards in Herefordſhire, aſſures us that the *redſtreak* is given up: the celebrated *ſtire* apple is going off; and the *ſquaſh* pear, which has probably furniſhed this country with more CHAMPAIGN than was ever imported into it, can no longer be got to flouriſh; the ſtocks canker and decay.

In Yorkſhire ſeveral fine old fruits, which were productive within his own recollection, are loſt: the ſtocks cankered, and the trees barren.

The famous *Hagloe* crab, which yields a cyder that for richneſs, flavour, and price on the ſpot, ſurpaſſes perhaps every other fruit liquor, having been valued at ſixty guineas the hogſhead, is confined to a ſmall diſtrict near Roſs in Herefordſhire, and will probably in a few years be extinct. Is it not ſurprizing that the cultivation of ſuch excellent varieties of fruit-trees ſhould be thus limited to a few particular counties, and ſo much neglected even in theſe; when probably, by due attention to ſoil, aſpect, and other leading circumſtances, they might be ſucceſsfully raiſed, and propagated in almoſt any quarter of the kingdom?

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* Rural Oeconomy of Glocceſterſhire, Herefordſhire, &c. vol. ii. page 253.

That fruit liquors, when of a good quality, and drunk with moderation, afford an uncommonly wholeſome and cheap beverage, is allowed on all hands, and confirmed by long experience.

Nor can any arguments againſt its utility be fairly drawn from its abuſe, or from the evils that neceſſarily enſue from the enormous quantities of bad cyder conſumed by day-labourers.

In the vale of Gloceſter, ſays Mr. Marſhall, ſix quarts a day is the common allowance; ſometimes nine or ten quarts; or an unlimited quantity! In a plentiful fruit year cyder is of very little value: men and maſters are equally adepts in the art of drinking; and the tales that are told of them appear ſo incredible, it is to be hoped they are not ſtrictly true. Drinking a gallon-bottle-full at a draught, is ſaid (on good authority) to be no uncommon feat:—a mere wanton trick that will not bear t be bragged of. But to drain a two-gallon bottl without taking it from the lips, as did a certain labourer, is ſpoken of as an exploit worthy an inhabitant of the Vale of Glouceſter!—Another man o the Vale, however, undertook *for a trifling wage to drink twenty pints of cyder, one immediately after another. He got down nineteen, (as the ſtory is gravely told) but theſe filling the caſk to the* bung, the twentieth could not of courſe get admittance: ſo that a Severn-man's ſtomach holds exactly two gallons three pints!—But the quantity drunk in this extemporaneous way by the men is trifling, compared with that which their maſters will ſwallow at a ſitting. Four well-ſeaſoned yeomen (well known in the Vale) having raiſed their courage with the nectarious juice of the apple, reſolved to have a freſh hogſhead tapped; then ſetting foot to foot, they entirely emptied it at one ſitting!*

Concerning the effects of ſuch extravagant feats performed by thoſe mad topers, our author is ſilent; but if ſimilar debauches are frequently committed with impunity (which ſeems ſcarcely credible) they afford a ſtriking example of the ſalubrity of cyder, perhaps not to be paralleled by any other vinous or fermented liquor. At all events ſuch wanton exceſſes ought by every poſſible means to be diſcouraged. But to the diſgrace of our police, the law which inflicts penalties on drunkenneſs, inſtead of being ſtrictly executed, is generally ſuffered to remain a dead letter. Meanwhile, I fear it will be in vain to admoniſh theſe thorough-paced ſoakers—or attempt to deter thoſe brutes in human ſhape from purſuing the high road to ruin! In vain ſhall we ſtrive to convince them that a habit of drinking learnt in youth, is not eaſily abandoned in riper years, and that a continued abuſe of even the moſt innocent fermented liquor, will, in the long run, infallibly prove a ſlow, but fatal poiſon!

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* Oeconomy of Glouceſterſhire, vol. i. p. 53.

ARTICLE XXXIV.

On the Poiſon of Lead, with Cautions to the Heads of Families concerning the various unſuſpected Means by which that inſidious enemy may find Admiſſion into the Human Body.

[illegible] the Same

> Hinc dira tormina [illegible] pendulæ, tremulæque manus!
>
> PLIN.

TO call forth latent abilities, and to promote a generous emulation amongſt our huſbandmen, manufacturers, and artizans, is the profeſſed object of the Bath Society. But while we thus endeavour to enlighten the minds, and to kindle the zeal of the common people, ought we not to inſtruct them moreover in the neceſſary means of preſerving their health? Without this, how ſhall we enable them to encounter with alacrity their laborious purſuits? Without health the daily taſk cannot be performed. The plough and the team lie uſeleſs—the buſy loom becomes ſilent—and all the œconomical arts languiſh! Till confined to the bed of ſickneſs, this uſeful claſs of people are of all others the moſt inattentive to their health. It is not till then that they begin to be truly ſenſible of its value, and then with heartfelt ſighs they deplore its abſence! Each rural ſcene that lately delighted the ſenſes, has on a ſudden loſt all its charms, and the gay face of nature is now beheld with an eye of indifference, or even diſguſt.

> For what are fields, or flow'rs, or ſtreams to me,
> Ah! taſteleſs all, if not enjoy'd with THEE,
> O HEALTH!————

It is always much eaſier to prevent diſeaſes than to cure them. Therefore to impreſs the common people with a due ſenſe of the importance of their health, and to put them on their guard againſt one of the moſt frequent, though unſuſpected cauſes of many of their chronick diſeaſes, is the buſineſs of this eſſay.

The miſchiefs ariſing from culinary poiſons preſent a wide field for diſcuſſion; but I ſhall confine myſelf at this time, *to the poiſon of Lead.* Is it not a moving ſpectacle to ſee poor induſtrious tradeſmen, particularly the manufacturers of red and white lead, daily expoſed to the noxious fumes of this pernicious metal? Unhappy men, whoſe hard lot it is to earn, by the ſweat of their brow, a ſcanty maintenance, breathing all the while a tainted air, and inhaling a ſlow poiſon at every pore, in order to prolong a wretched exiſtence! Theſe ſurely have a peculiar claim to our compaſſionate regards, and I ſhould think myſelf happy if I could awaken the attention of this Society towards the alleviation of their ſufferings.

The London Society have not been inattentive to this great object, as appears from their late premiums, particularly concerning a ſubſtitute for white lead, or a method of diveſting it of its deleterious quality;—an object highly worthy your conſideration, as this noxious ſubſtance conſtitutes the baſis of all our common paint, the injurious effects of which are univerſally complained of.

The extenſive uſe of lead in various forms, enables it to aſſail all the avenues of life.——Sometimes it attacks the human frame by an open

aſſault,

aſſault, but more frequently it makes inroads into the conſtitution as a ſecret unſuſpected enemy. Various cauſes conſpire to favour its introduction into the ſyſtem. The arts of chemiſtry, of medicine, and even of cookery, have all ſucceſſively lent their aid; inſomuch that no perſon of whatever rank or ſtation, from the prince to the peaſant, can at all times pronounce himſelf perfectly ſecure againſt its ſilent depredations. Devoutly therefore, not ludicrouſly, may we now exclaim with Sir John Falſtaff,

> "Heavens, keep lead out of us!"

The jovial knight, like a *bon-vivant* of the preſent day, not dreaming of its admiſſion into his body by any mode but one, viz. that of a leaden-ball, continued to quaff his ſack in ſeeming ſecurity, while each draught probably contained a portion of the deteſted metal which he ſo piouſly deprecated. For our anceſtors in thoſe days were no novices in the myſtery of refining liquors with lead, though by no means ſuch able adepts as their ſucceſſors, who (to do them juſtice) appear to have carried the art to its *ne plus ultra.*

But to be ſerious:—Though the above apprehenſions to ſome may ſeem imaginary, or at leaſt exaggerated, yet whoever attentively conſiders the well-authenticated facts adduced by Sir George

Baker, Dr. Percival, and other eminent authors, concerning this poiſon, will ſoon be convinced that they are but too well founded, and conſequently that theſe cautions are not altogether ſuperfluous. Seldom do the common people err through exceſs of caution, but often through the want of it. Few of them indeed have leiſure or inclination to trace this ſubject through a variety of medical volumes, who nevertheleſs peruſe, with eagerneſs, the Society's papers, or other ſhort eſſays in which they conſider themſelves to be materially intereſted. The following admonitions, therefore, are not addreſſed to the medical faculty, but to the heads of families, whoſe duty it is to watch over the health of thoſe who are committed to their charge.

GENERAL EFFECTS
OF THE
POISON OF LEAD.

LEAD in every form is unfriendly to animal and vegetable life. The miners who dig the ore, the ſmelters who reduce it to a metallic ſtate, manufacturers of white lead, painters, plumbers, in a word, all who are much expoſed to its effluvia, bear teſtimony to its pernicious effects. Its fumes are found no leſs deſtructive to domeſtick animals, ſuch as dogs, cats, fowls, &c. nay, even vegetables in its neighbourhood ſoon loſe their verdure; nor can plants thrive in pots compoſed of this metal. Its various preparations, as litharge, red and white lead, are all poiſonous, and their activity is increaſed by their union with acids. Lead unfortunately being thus liable to be corroded, or even diſſolved, by almoſt every ſpecies of acid, the dangerous conſequences are proportionably increaſed. For it not only unites with the ſtronger mineral acids, but alſo with thoſe of the weaker vegetable kind, as that of wine, beer, cyder, vinegar, verjuice, &c. to which it imparts a manifeſt ſweetneſs, forming a ſalt termed ſugar of lead. Hence the foundation of that moſt dangerous abuſe of correcting acid wines and cyder with litharge, or other preparations of this metal. Lead alſo unites with expreſſed oils, and other unctuous bodies, as butter, ſuet, lard, &c.

Hence in Holland it has been cuſtomary to correct the more offenſive expreſſed oils, ſo as to ſubſtitute them for oil of olives, or almonds, by impregnating them with lead.—Another horrible abuſe, and which merits the moſt exemplary puniſhment! Deliberately thus to adulterate the common articles of life with a ſlow poiſon, and wantonly to ſacrifice the lives of innocent perſons to unfeeling avarice, ſeems a refinement in villainy at which human nature revolts, and which could hardly be credited in a Chriſtian country! The ſavage tribes of the moſt barbarous nations, who attack their declared enemies with poiſoned arrows, are never known to diſcharge them at their unoffending neighbours and countrymen.

To ſuch an alarming pitch had the dangerous art of adulterating liquors with lead arrived in France, that at length it became neceſſary to make it a capital offence. *I am unwilling to believe that any man would preſume to practiſe this inhuman fraud*, were he fully apprized of the poiſonous nature of the ingredient. That none of my readers may plead ignorance, I ſhall briefly mention its principal effects.

This metallick poiſon then is powerfully ſtyptick, and highly injurious to the nerves, hence it ſuppreſſes the natural inteſtinal diſcharges, producing obſtinate coſtiveneſs, and a peculiar ſpecies of colick terminating in palſy of the extremities, which generally deprives them of motion, without deſtroying their ſenſation. Theſe ſymptoms, being the genuine effects of lead, ſeem to mark its ſpecifick power, and to diſtinguiſh it from every other poiſon.

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It

It moreover occaſions a pale ſallow countenance, contraction and waſting of the muſcles, numbneſs, tremors, languors, convulſions, epilepſy, and death. —Theſe ſymptoms vary according to the quantity of the poiſon, the ſtate of the body, the irritability of the ſyſtem, and other circumſtances. Sometimes, without producing ſpaſms or other violent ſymptoms, it only occaſions a ſlow lingering indiſpoſition, which, however, laſts ſome years, and at length generally eludes the power of medicine. This well accords with what has been tranſmitted to us concerning the ſlow poiſons of the ancients, and ſeems to confirm the ſuſpicion that their baſis was no other than a ſecret calx of lead.—May this fatal calx long reſt in oblivion, and never more be revived!

Various ways in which it is admitted into the Body.

This poiſon may be received into the body in diet, and in medicine.

1. *Diet.*—Water, which conſtitutes ſo large a proportion of diet in every nation, is generally conveyed through leaden pipes, or cylinders of pumps, and is often left to ſtand in leaden ciſterns. As theſe have ſometimes been found corroded in certain places, by *Newman* and other chemical

writers, it has been ſuſpected, and not without reaſon, that the water might thus receive a ſlight impregnation from the metal.—*Galen* and *Vitruvius* loudly condemn leaden pipes for the purpoſe of conveying water, becauſe their internal ſurface contracts a covering of white lead. *Dr. Heberden* kept water in which lead had been immerſed twelve years: the water exhibited a whitiſh powder at the bottom, and gave a brown tinge to a ſolution of orpiment, and volatile tincture of ſulphur—proofs of the preſence of lead. *Sir George Baker*, however, repeated the experiment by keeping water in a leaden tube, but at the end of two months the water diſcovered no ſenſible impregnation by the above teſts. He relates however, on the teſtimony of *Dr. Wall*, that a family in Worceſter ſuffered a long tedious indiſpoſition, with ſome ſymptoms of this poiſon, in conſequence of daily uſing a hard aluminous water. On examining the pump, the leaden cylinder was found corroded, and even perforated by the water, although it had been repaired only three years before. On removing to another houſe ſupplied with better water, the family at length recovered their wonted health. From theſe facts it would appear, that water, under certain circumſtances, is capable of corroding lead, ſo as to prove injurious to health. Some authors affirm, others poſitively deny this concluſion. Pure water, it is true, is no menſtruum for lead, but rarely do we meet with water that is pure. Pump or ſpring water is generally impregnated with a ſmall portion of vitriolick or marine ſalt, but lead is hardly capable of detaching theſe acids from an alkaline or earthy baſis, and therefore cannot communicate any poiſonous quality to the water: hence this metal, though immerſed in a ſolution of alum, remains unchanged. Nor can the aërial acid enable water to act upon lead. But ſhould the water contain any mineral or vegetable acid, uncombined with earth, a circumſtance which rarely occurs, it may then, though in a very dilute ſtate, corrode the metal ſufficiently to produce miſchievous effects. This ſeems actually to have been the caſe at Worceſter. For it certainly muſt have been an acid, not alum, that corroded the lead.——This may ſuggeſt to us the following cautions:

1ſt. That whenever water betrays any ſenſible mark of acidity, by an aluminous taſte, or by changing ſyrup of violets red, ſuch water, if meant for internal uſe, ought never to come in contact with lead.

2dly. Water conveyed from the leaden gutters of houſes, or ſtanding long in leaden ciſterns expoſed to falling leaves, from which it may acquire an acid quality, is alike exceptionable. To this cauſe, *M. Tronchin* attributed the epidemick colick which ſome years ago prevailed at Amſterdam.

WINES.—It is worthy obſervation, that the endemial colick, which formerly was wont to infeſt the inhabitants of Poitou, ſo as to become proverbial, is now no longer known, ſince the practice of adulterating wines has been aboliſhed from that diſtrict. In whatever country the liquors are impregnated with lead, either by accident or deſign, this diſeaſe will be found to prevail, as will, I think, more fully appear in the ſequel. Hence the colick of Poitou, and of Devonſhire, and the dry belly-ache of the Weſt-Indies, (whatever ſome may aſſert to the contrary) are evidently one and the ſame diſeaſe, and may clearly be traced to the ſame cauſe, namely, the poiſon of lead.

Notwithſtanding the ſeverity of the laws, the fatal abuſe ſtill prevails, particularly in many parts of France and Germany, where their weaker wines, being prone to acidity, are ſtill, in defiance of all laws, human and divine, corrected with litharge, or ſweetened with ſugar of lead! Nor is this wholly confined to the lower white-wines, ſuch as the Rheniſh, and the Moſelle, for in a late French publication, intitled LA MAISON RUSTIQUE, a large ball of lead is piouſly directed to be ſuſpended in the caſk, in order to prevent the wines of *Burgundy* from turning acid! At Paris, the low meagre wines commonly ſold to the populace are made to run through a leaden channel, and are diſtributed to the cuſtomers in meaſures compoſed of tin, or baſe pewter, containing a large portion of lead. Accordingly the colick of Poitou is ſtill predominant in Paris. *Dr. Gadane* computes the average number of inhabitants annually afflicted with this diſeaſe to amount to five or ſix hundred. *M. Senac*, late phyſician to the King of France, adds his teſtimony concerning the frequency of the diſeaſe at Verſailles. *Dr. Warren* enumerates thirty inſtances among the ſervants and domeſticks of an Engliſh nobleman, during his reſidence at Hanover, all occaſioned by the ſame cauſe. It has been obſerved with ſurprize that, at Surinam, the Europeans who drink French wines are extremely liable to this diſeaſe, while the natives, who refrain from this beverage, entirely eſcape.

If we turn our attention to our Engliſh *made* wines, I fear they will by no means be found clear of ſuſpicion. In Graham's art of making Britiſh wines, are the following choice receipts:

1. *To ſoften Green Wine.*

Put in ſome vinegar wherein *litharge* has been well ſteeped; and put a quart of it into a tierce, and this will mend it, in ſummer eſpecially.

2. *To hinder Wine from turning ſour.*

Put a pound of melted lead in fair water into your caſk pretty warm, and ſtop it cloſe.

From which it appears that William Graham was deep in the myſtery of vintners: and his book having gone through no leſs than ſix editions, may be reaſonably ſuppoſed to have revealed the dangerous ſecret of thoſe adepts in iniquity, to at leaſt three thouſand innocent families, together with their friends and connections! But to eſtimate the ſum total of miſchief accruing from the numerous receipt-books of this ſtamp publiſhed within theſe fifty years paſt, "highly neceſſary (as the editors gravely obſerve) to ALL FAMILIES," entirely baffles calculation! For, according to the ſage advice of thoſe worthy authors, ſcarcely any family is now found without one or more of their "faithful guardians of health, or truſty monitors in every thing relating to food or phyſick!"

To ſupply the publick with an effectual antidote to the various poiſons conveyed in theſe books, and diſſeminated far and wide amongſt the people, would be worthy the pen of the ableſt chemiſt, and every life thus reſcued from their pernicious effects would well intitle him to a civick crown.

Rum.—The dry belly-ache, or in other words, the colick of Poitou, is a prevailing diſeaſe in the Weſt-Indies, particularly among thoſe who drink rum. Some attribute it to the newneſs of the ſpirit, others to the acid juice of the limes which generally accompanies its uſe. But the former, when genuine, is inadequate to the effect; the latter, inſtead of producing the diſeaſe, is found rather to be a remedy.

Dr. John Hunter, in the year 1781, being ſtationed with the army at Spaniſh-town in Jamaica, finding this diſeaſe very prevalent amongſt the ſoldiers who drank *new* rum, while others who abſtained from it remained free, began to examine cloſely the liquor, and alſo the implements uſed in the diſtillery. The rum, in his experiments, gave evident ſigns of an impregnation of lead. The worm of the ſtill, conſiſting of a large proportion of lead, he found corroded. An acid reſiduum called *dunder*, it ſeems, is added to the mixture before diſtillation, and partly riſes with the ſpirit. No wonder then that the lead was corroded by it. The ſpirit, in proceſs of time, in a great meaſure depoſits the lead, hence old rum is ſound much leſs unwholeſome than new. If rum be left to evaporate in a glaſs it leaves an acid remnant behind. He further adds, that if a piece of lead be immerſed in *pure* proof ſpirit the ſpace of ten weeks, the liquor is found to have acquired a ſlight impregnation from the metal—A new and ſingular circumſtance; but which, I believe, never can take place where *pure* ſpirit is employed.

The nitrous acid is ſometimes clandeſtinely uſed to correct ill-flavoured rum, and ſuch an adulterated ſpirit may be readily conceived capable of acting on lead, though *pure* ſpirit certainly cannot. Hence it is eaſy to ſee how the above deception in the Doctor's experiment might tend to miſlead his judgment. Diſtilleries, and even breweries, with all their apparatus, ought to undergo a narrow inſpection, as acids, and even their effluvia, are capable of corroding lead. Therefore the leaden worms, ſpouts, gutters, in a word every utenſil containing that metal, ought to be viewed with a jealous eye. Nor ought the enquiry to be confined to theſe places alone: for if we extend our views to our wine and cyder-preſſes—dairies, kitchens, and ſtore-rooms, we ſhall probably meet with much to be complained of—much to be reformed. Whether the apothecary's ſhop, or even the elaboratory of the chemiſt, will bear a very cloſe ſcrutiny, may perhaps be juſtly doubted. For be it remembered, that not only lead and pewter, but alſo the tinning of copper veſſels, the ſolder containing a mixture of lead, and the glazing of earthen ware being a calx of lead, are all liable to be corroded by acids, or even expreſſed oils.

CYDER.—That acid wines or crude cyder may, independent of any adulteration, produce bowel complaints, attended with griping pains, and diarrhea, cannot be denied, but that they ſhould occaſion a colick, complicated with coſtiveneſs, and terminating in palſy, is highly improbable. On the contrary, that this diſeaſe is the genuine produce of the poiſon of lead ſeems to have been proved by the moſt ſatisfactory evidence. The Endemial colick of Devonſhire, aſcribed by *Dr. Huxham* and others, to the acidity of new cyder, has at length been clearly traced to the above poiſon.

From the elaborate eſſays of *Sir George Baker* on this ſubject, it appears, that, " in thoſe diſtricts where the diſeaſe was moſt prevalent, lead was generally found in the preſſes or utenſils employed in making the cyder, and that on analyſing the ſuſpected liquor, he obtained from it a ſmall portion of *real* lead:* That ſome of the farmers had been known to buy ſugar of lead to correct the acidity of their cyder! That others, in order to preſerve their weak cyder for the uſe of their labourers, were wont to have recourſe to the well-known ſecret of ſuſpending a leaden ball in the caſk: That the cyder is generally drawn into large *glazed* pitchers, in which it often ſtands many hours before it is drunk by the labourers: And finally, that according to the teſtimony of the late *Dr. Charlton*, moſt of the paralyticks recommended to the Bath Hoſpital were ſent from the cyder counties, except Herefordſhire, where, on enquiry, it was afterwards diſcovered that lead was not employed in any part of the cyder apparatus of that county."

"Since the above was written, however, I am ſorry to find, from *Mr. Marſhall's* late ſurvey of the Cyder-proceſs in Herefordſhire, that lead is not

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* This, I am not ignorant, has been ludicrouſly attributed, by ſome of his Devonſhire antagoniſts, to leaden ſhot accidentally left in the bottles before the cyder was bottled: By others, to a portion of lead introduced by deſign, in order to raiſe a laugh at the Doctor's expence. But admitting ſo accurate an obſerver could ſo eaſily be impoſed upon, (which is highly improbable) yet the doctrine reſts not on this experiment alone, but on a ſeries of facts which will ſtill remain unſhaken; and which, perhaps, will not be found eaſy to overturn.——For the circumſtances have been communicated by different authors at different periods, and without the ſlighteſt appearance of colluſion, and yet all tend to the ſame point.

wholly diſcarded, but a portion of the old leaven is yet ſuffered to remain. "The bed or floor of the "preſs, (ſays he,) which is now generally compoſed "of wood or ſtone, formerly was uſually covered "with lead, which, by being diſſolved in the *acid* "of the liquor, has probably been the cauſe of "much miſchief. Nevertheleſs, lead is ſtill ſuffered "to remain about ſome cyder-preſſes. There is a "publick mill at Newnham, whoſe bed is *entirely* "covered with lead; and I have ſeen others whoſe "lips, or ſpouts, and a rim round the outer edge, "are of that dangerous metal!"*

A ſtriking inſtance of ignorance, obſtinacy, and impolicy! otherwiſe a practice ſo injurious to health, and detrimental to the credit of the liquor, would not be thus abſurdly perſiſted in. I know it is pretended that the quick paſſage of the apple juice through ſuch ſpouts or gutters does not afford time for any impregnation. But this is a miſtake, for the leaden ſurface being often wetted, and alternately dried by expoſure to the air, contracts minute particles of ceruſs, or ruſt of lead, ready to be waſhed off, and diſſolved in the courſe of the proceſs. Sometimes the juice is even ſuffered to ferment in veſſels lined with lead, which ſtill greatly increaſes the danger. An inſtance of this kind lately occurred at Frome:—A family of three perſons drank freely of this liquor, and were at length ſeized with the colick of Poitou. The maſter who drank the greateſt quantity, ſuffered moſt, and his diſeaſe terminated in a fatal palſy;—the wife and maid-ſervant, who drank leſs, underwent ſimilar ſymptoms, but eſcaped with life.

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* Rural Oeconomy of Glouceſterſhire, Herefordſhire, &c. p. 313.

It is high time that this, and the ſtill more unpardonable abuſe of wilfully adulterating cyder with lead, ſhould be wholly ſuppreſſed;—that an enquiry ſhould be ſet on foot through all the cyder diſtricts, that ſuch practices may be detected wherever they exiſt; and that the colick of Poitou may no longer be emphatically ſtiled the colick of Devon.

Milk *and* Cream.—The veſſels of our modern dairies conſiſt chiefly of lead, or earthen-ware glazed with a calx of that metal, both which are liable to be corroded by weak acids, and oily ſubſtances. Whether the milk and cream are ſuffered to remain in them long enough to acquire an impregnation of the metal, has not been determined: but the acid odour which ſtrikes the noſtrils on entering certain dairies, eſpecially in a warm ſeaſon, is at leaſt ſufficient to excite ſuſpicion, and to put the publick on their guard till the ſafety of theſe veſſels be more fully aſcertained. My late ingenious friend *Mr. Hayes* has already offered ſome judicious ſtrictures on the abuſe of theſe veſſels in dairies, and mentioned others as proper to be introduced in their place.*

But if veſſels of caſt-iron, which he propoſed to ſubſtitute for leaden ones, ſhould be found to impart an unpleaſant colour or chalybeate taſte to the milk, (as we have reaſon to apprehend) it will prove an inſuperable objection to their uſe. After all; the wiſeſt ſtep would be to return to the ancient wooden bowls of our anceſtors, than which nothing can be more perfectly ſafe or free from ſuſpicion.

VINEGAR, PICKLES, ACID FRUITS, *&c.*—Theſe act powerfully upon lead and its preparation, and, it is to be feared, often acquire an unſuſpected impregnation of that metal in various culinary proceſſes. Thus when vinegar is diſtilled in a pewter alembick, or paſſes through the worm of a common ſtill, it carries with it a portion of the metal. The proceſs ought therefore always to be performed in ſtone or glaſs veſſels.—It is a very common, but dangerous miſtake, to ſuppoſe that vinegar may be truſted to glazed earthen-ware with perfect ſafety, ſince vegetable acids act more forcibly on the calces of lead than on the metal itſelf; hence the ſevere colicks often brought on in time of harveſt among the poor labourers, from drinking cyder after ſtanding but a few hours in glazed pitchers.†

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* See the Bath Society's Papers, vol. iv. art. 10.

Yet glazed earthen-ware, in a variety of forms, conſtitutes the veſſels in which pickles are kept; in which acid fruits are preſerved; and in which various kinds of tarts are baked. It is moreover curious to obſerve, that a marked preference is given to them by moſt frugal houſewives, who find by experience that ſuch veſſels occaſion a material ſaving in the article of ſugar:—but they remain to be told, that the increaſed ſweetneſs proceeds from the acid of the fruit being blunted by its union with the glazing of the veſſel, which has a more pernicious tendency than they ſeem to be aware of. For certainly theſe good ladies would not deſignedly ſweeten our viands with ſugar of lead!

Here it ought to be remarked, that there is a material difference in the mode of glazing veſſels. The glazing of *ſtone* ware and china, being a vitrification of the clay, is indiſſoluble in acids, therefore ſuch veſſels are perfectly ſafe; while the glazing of ordinary *earthen*-ware, conſiſting of a calx of lead, is eaſily acted upon by acids, and yields a noxious quality.

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† London Medical Inquiries, vol. v. p. 404.

The ſame remark is in ſome meaſure applicable to veſſels lined with tin. Pure block-tin, it is true, gives no impregnation to vinegar or acid juices, but the generality of tinned veſſels contain a conſiderable alloy of lead, beſides what is uſed in the ſolder. This is very diſtinguiſhable even by rubbing a finger over them, which will ſoon acquire a blackiſh hue from the lead; a circumſtance worthy notice, as too much confidence is generally placed on the ſafety of tinned veſſels. Not to mention the danger of the tin lining ſoon wearing off, and leaving a copper ſurface expoſed. Hençe the fatal accidents that have enſued from acid ſauces and gravy ſoups ſtanding too long in ſuch veſſels, and acquiring thereby an impregnation doubly dangerous. For here the poiſon of lead, and verdigris, combine their united forces to undermine the human frame!

The Dutch have been accuſed of correcting the rancidity of oils, and even butter, by pouring melted lead into them. If this be true, the ordinary practice of preſerving ſalted-butter or hog's lard in glazed earthen veſſels for kitchen uſe, may indeed diminiſh their tendency to rancidity, but not without communicating a more dangerous quality.

But what ſhall we ſay to the ſtill more hazardous practice of chemiſts and apothecaries, who, till very lately, have been ſanctioned by no leſs authority than that of the College Diſpenſatory to boil their oxymels, compoſed chiefly of honey and vinegar, in *glazed* earthen veſſels, for ſuch the words "*vaſe fictili vitreato*" plainly import! And it is much to be feared the direction will continue to be literally obeyed by thoſe who are ſtill ignorant of its dangerous tendency. Such an overſight cannot be ſuppoſed long to have eſcaped the notice of that learned body; but is it not ſtrange they ſhould ſuffer this, and ſome other obvious blemiſhes, to diſgrace one of the moſt elegant Diſpenſatories in Europe, from the year 1746 till the new edition of 1788, wherein I am glad to find them expunged, and that glaſs veſſels only are expreſsly ordered for ſuch purpoſes in future? The old pewter funnels and meaſures, however, ſtill continue to be found in almoſt every ſhop. Into theſe are poured, without heſitation, vinegar and other acids; and the veſſels ſometimes, through hurry, are ſet by unwaſhed. On expoſure to the air for ſome time, a fine eſfloreſcence of ſugar of lead is formed on the inner ſurface, ready to ſweeten the *next* draught or julep that happens to be poured into them.

Tea is imported into this country in cheſts lined with ſheet lead.—This, like other vegetables, contains a weak acid, which quality is probably heightened by a latent fermentation which tea undergoes when damaged by moiſture. May it not in this ſtate act on the metal? How far the tremors, depreſſion of ſpirits, and other nervous ſymptoms generally aſcribed to this vegetable, or the hot water in which it is infuſed, may not, in ſuch inſtances, with equal probability be attributed to the lead in which it is incloſed, is left for future obſervation.

Saturnine Medicines.—Lead, though a poiſon, yet in ſkilful hands is capable of being rendered an uſeful medicine, and therefore is ſtill properly allowed to retain a place in the Diſpenſatory. As a cooling ſedative, it ſuddenly allays pain and inflammation; as a ſtrong ſtyptick, it powerfully checks the bleeding of ruptured veſſels, and other profuſe evacuations. Its moſt active preparation is ſugar of lead; but every preparation of this metal undoubtedly demands the utmoſt circumſpection, and particularly when it is adminiſtered internally. By combining it with opium, to counteract its deleterious effect on the bowels, I have ſometimes ventured to give it in certain deſperate caſes, and that with very evident advantage.† As lead enters the compoſition of a variety of applications, deſigned for external uſe, as lotions, eye-waters, ointments, plaiſters, &c. the untoward ſymptoms which ſometimes ſucceed, are totally unlooked for, and therefore generally referred to every cauſe but the right one. Among the popular applications of this claſs, *Goulard*'s famous Extract of Saturn, and his vegeto-mineral water, ſeem to ſtand at the head of the liſt; and though perhaps inferior to an aqueous ſolution of the ſugar of lead, are nevertheleſs far more faſhionable remedies. Applications of this nature may, it is true, be uſed with tolerable ſafety where there is a whole ſkin, and its texture ſufficiently entire to prevent abſorption. But where it is ſoft and ſpungy, or the ſcarf ſkin ſtripped off, or ulcerated, the poiſon of courſe will be more liable to be abſorbed into the ſyſtem, and to produce its pernicious effects. Inſtances of this have been remarked by my friend *Dr. Percival*, and other accurate obſervers. To prevent the tender ſkin of infants from being excoriated, nurſes ſeldom fail to ſprinkle the parts plentifully with white lead. Hence perhaps the ſevere gripes and fatal convulſions which ſo often enſue, though generally attributed to other cauſes.

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† Even thus guarded, the doſe ought to be cautiouſly increaſed, and perhaps never exceed three or four grains a day. What are we to think then of certain Engliſh Diſpenſatories and Compendiums of Phyſick, (the daily companions of all our young practitioners) which gravely recommend it to be given from ſeven to nine, nay even to twelve grains and upwards a day! See Quincy's Diſpenſatory, Shaw's Practice of Phyſick, Ball's Practice of Phyſick, Naval and Military Diſpenſatory—in which laſt twenty grains are ordered for a ſingle doſe!

Children's Playthings are commonly painted with a compoſition of red or white lead; but how often do we ſee the ſmiling innocents ſuck within their lips thoſe pernicious toys, while the unſuſpecting parents look on with apparent ſatisfaction! The application of an ointment with litharge, or white lead, to nurſes ſore nipples, often proves fatal to ſucking infants: twelve inſtances of this ſort are recorded by *Sir George Baker* to have happened at Dartmouth.—Our common red wafers receive their colour from red lead. When theſe are accidentally picked up by tame birds, they ſoon prove fatal, which ought to be a caution to thoſe inconſiderate perſons who are fond of not only chewing, but ſwallowing them.

Painters in Water-colours are equally reprehenſible for incautiouſly moiſtening their pencil with their lips, and frequently holding it in their mouths a conſiderable time. Thus the ſaliva, repeatedly imbued with a ſlow poiſon, is inſenſibly ſwallowed from day to day, till at length the health becomes viſibly impaired without the cauſe being ſuſpected, unleſs the colick or palſy ſhould ſupervene.†

Cosmeticks.—Were it permitted us to penetrate the ſecret receſſes of the toilet, and to explore at leiſure the nature of the myſterious articles which adminiſter ſo conſpicuouſly to artificial beauty, we ſhould probably find that ſome of the moſt celebrated coſmeticks conſiſt of preparations of lead, mercury, or biſmuth.

Carmine, or harmleſs rouge, (as the ladies are pleaſed to term it) is a preparation of cochineal in nitrous acid, with ſome other ingredient which is kept a profound ſecret. This favourite compoſition, which gives the roſeate bloom to their countenance, being prepared with a ſtrong mineral acid, is not perhaps altogether ſo very innocent as they imagine: beſides, its exceſſive dearneſs renders it an object of adulteration; and vermillion, (a preparation of mercury) though an humble imitation, affords a cheap and inviting ingredient to mix with it. To this, in its ſimple or combined ſtate, they are generally beholden for their roſes, while a calx of lead, or, what is equally pernicious, the magiſtery of biſmuth, gives the laſt poliſh to the lily-whiteneſs which ſo dazzles our eyes.* It is thus our modern Hebes attempt to preſerve a perpetual bloom, and to hold wrinkles and old age at defiance. But alas! theſe pernicious ingredients, like mercury, though only uſed externally, are liable to be imbibed at every pore, and thence convey a ſlow poiſon into the ſyſtem, highly injurious to health; and, what may appear ſtill more formidable, deſtructive to beauty! For diſmal to relate! the cold cream, the pomade divine, or whatever ſpecious titles ſuch compoſitions may aſſume, at laſt betray their truſt; and, inſtead of beauty, produce real deformity! The artificial roſes ſoon fade, the angelick whiteneſs contracts a dingy brown, when the maſk falls off, and the ſpectre ſtands confeſſed![†] Strange that Britiſh ladies, to whom nature has been ſo bountiful, ſhould diſtruſt their native charms, and have recourſe to ſuch wretched ſubſtitutes of art! Is it not truly mortifying that they ſhould thus ſtoop to adorn, or rather diſguiſe their perſons, at the expence of their health!

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† A diſcovery we owe to the ſagacity of my late excellent friend Dr. J. Fothergill.—See London Medical Inquiries, vol. v. obſ. 37.

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* This poiſonous compoſition is generally dignified by the pompous title of pearl powder, and ſold as perfectly innocent. It has however proved fatal to ſome, and ruined the health of many others, without being even ſuſpected. I am credibly informed, that thoſe ladies who are in the habit of enamelling their faces, necks, and boſoms, with this white paint, generally fall early victims to their own indiſcretion; but particularly ſo if they happen to undergo the ſmall-pox, even by inoculation. Nor is this to be wondered at; the puſtules being unable to penetrate outwardly through the enamelled ſkin, the virus recedes inwardly, and preys on the vital organs.

But to quit ſo humiliating a ſubject. If what has been offered be not ſufficient to put them on their guard, more would be ineffectual. However, before I conclude, there is one ſimple coſmetick I can venture with confidence to recommend to the ladies, as a perfectly ſafe, cheap, and efficacious ſubſtitute for all the pernicious tribe above-mentioned, and which may be freely uſed without any riſk of detection,—a coſmetick which boaſts the higheſt antiquity, and is perhaps the only true one acknowledged by Nature. It is not only innocent, but highly conducive to health. It clears the complexion far beyond the milk of roſes; and when accompanied with regular hours and briſk exerciſe in the open air, diffuſes over the countenance a more animated bloom than the fineſt rouge.—It is now needleſs to add, that this grand ſecret is no other than cold Spring Water!

[†] Particularly on expoſure to the ſun, a hot fire, or ſulphureous vapours.

Method of detecting Lead by Chemical Teſt.

To point out a certain method of detecting the poiſon of lead, in whatever form it may be found lurking, next demands our conſideration. This happily is practicable; but the principle on which it depends cannot be clearly underſtood but by thoſe who are tolerably verſed in chemiſtry. The fact, however, is highly intereſting to the publick, and therefore ought to be univerſally known. In whatever ſubſtance, then, this inſidious enemy may lie in ambuſh, whether in wine, cyder, foods, medicines, or coſmeticks, the following teſt, like the touch of *Ithuriel*'s ſpear, inſtantly brings the culprit to light.

Take of yellow orpiment in powder..........1 ounce,
—— of quick-lime freſh from the kiln.... 2 ounces;
—— of diſtilled water boiling hot...........20 ounces.

Let the whole ſtand twenty-four hours in a cloſe veſſel of glaſs or porcelain, ſtirring the mixture with a wooden ſpatula. Then carefully decant the clear liquor, and ſtrain it into a bottle, which muſt be well ſecured and kept for uſe. Frequent expoſure to air, deſtroys its tranſparency.

REMARKS.

1ſt. If a few drops of this liquor be put into a glaſs of wine or other ſuſpected liquor, and no change of colour, or viſible alteration enſue, be aſſured ſuch liquor is free from lead, or metallick adulteration.

2dly. If the liquor contain the ſlighteſt impregnation of lead, as litharge, or ſugar of lead, (the ſubſtances generally employed for the purpoſes of adulteration) on adding the teſt a precipitation will enſue of a *duſky brown ſediment.*

3dly. If the ſuſpected liquor be high coloured, it muſt be previouſly diluted with treble its quantity of diſtilled water, or the change will not be ſufficiently perceptible: and care muſt be taken to add deliberately from three to ſix drops *only*, attentively marking the alteration. A larger quantity may re-diſſolve the precipitate, and ſoon render it inviſible.

4thly. As iron and other metals may produce a change of colour and precipitation, if any doubt ſhould ariſe concerning the nature of the precipitate, let a quart of the ſuſpected liquor be evaporated in a large crucible to an extract, and afterwards calcined in a red heat. When it is cold the metallick particles may be diſcovered in their proper form in the aſhes.—Or the precipitate may be examined without a tedious evaporation, if it be placed on charcoal, and the flame of a candle be directed upon it with a blow-pipe, by which it may ſoon be reduced to its metallick ſtate.

5thly. If to any medicine, perfume, or coſmetick in form of powder, liquid, or ointment, a few drops of this liquor be added, a brown colour will ſoon appear, if any impregnation of lead be preſent in the compoſition.

6thly. The vitriolick acid and ſaccharine acid may alſo be employed to precipitate lead from liquors, but the above teſt appears to me preferable to any thing of the kind yet diſcovered.

Preſervative Method.

Smelters, plumbers, painters, and manufacturers of red and white lead, in carrying on their dangerous operations, often perceive a ſweetiſh taſte, attended with a ſlight nauſea, or ſenſe of faintneſs, evidently proceeding from the ſugar of lead. But this approach to diſeaſe is too commonly neglected till health is completely ruined. Such perſons ſhould, previous to their going to work early in the morning, inſtead of drinking a pernicious dram, take a ſpoonful of caſtor oil, or oil of olives, and uſe fat oleaginous foods. For their further protection they ought to avail themſelves of a free ventilation to carry off the noxious vapours, and alſo to breathe through mufflers compoſed of double cloth or flannel well dipped in an alkaline ley, and alſo be careful to throw off their dirty clothes the moment their work is over. By theſe precautions they probably might be in a great meaſure preſerved from the poiſonous fumes that daily ſurround them.—The like method of prevention is no leſs applicable to thoſe who are occupied in other pernicious minerals, as grinders of verdigris, gilders in water-colours, workers in quickſilver, &c.

Method of Cure.

The treatment of the various ſtubborn diſorders reſulting from the poiſon of lead belongs not to the common people, but demands the early aid and attention of a judicious and experienced phyſician, who perfectly underſtands the chemical and medical properties of this mineral. Such a practitioner, however, is not always at hand; therefore to prevent improper management, or loſs of time, I ſhall briefly ſketch out the principal outlines of cure, which is all that can be attempted in the preſent eſſay. At firſt the poiſon generally exerts its virulence on the inteſtines under the form of colick, attended with ſevere pain, obſtinate coſtiveneſs, and frequent retchings, which may be called the firſt ſtage. Theſe ſymptoms are generally ſucceeded by a paralytick affection of the extremities, accompanied with numbneſs, loſs of motion, and frequent pains through the limb affected. This may be conſidered as the ſecond ſtage.

In the firſt ſtage, the chief intention is to reſtore a free paſſage through the bowels. But this is not to be attempted by ſtrong emeticks, or rough purgatives, which, inſtead of anſwering the intention, ſerve but to exaſperate the ſymptoms. The pain muſt firſt be allayed, and the ſpaſm relaxed by a liberal uſe of opium and the warm bath, before purgatives can be retained, or adminiſtered with any proſpect of ſucceſs. A truce being thus obtained, evacuants will then have their deſired effect. And if mild lenient catharticks, ſuch as caſtor oil, calcined magneſia, Epſom ſalt, or phoſphorated ſoda, ſhould anſwer, it will be unneceſſary to have recourſe to the more draſtick ſtimulating kind. Their operation will be greatly aſſiſted by copious dilution with warm mutton broth, or new milk whey. As ſoon as the bowels are thoroughly emptied by this preparative courſe, they muſt be kept in a ſoluble ſtate by ſuch remedies as are gently laxative, and at the ſame time have a direct tendency to decompoſe the poiſon. Such a remedy is liver of ſulphur, which poſſeſſes both theſe qualities in an eminent degree, and therefore promiſes to become one of the moſt powerful antidotes againſt this, and perhaps other metallick poiſons. It is, however, too nauſeous and unpalatable to be taken for any length of time in its natural ſtate of hepar, though either of the ingredients may be taken ſeparately without the leaſt diſguſt. Therefore ſimple flowers of ſulphur may be taken in any agreeable form; and if waſhed down with lime-water, or a weak alkaline lixivium, the reſult will be a hepar, and the effect the ſame.

When that remarkable tranſition of the diſeaſe from the bowels to the extremities, which ſo diſtinctly marks out the ſecond ſtage, commences, the colick is immediately transformed into a palſy.

The indication now is to ſubdue the reliques of the poiſon which infeſt the nerves of motion, and alſo to reſtore the energy of thoſe muſcles whoſe action is impaired. Nothing bids ſo fair to anſwer this intention as warm mineral waters of the ſulphureous and chalybeate kind, eſpecially when they are uſed both internally and externally. Hence the ſurprizing efficacy of the BATH WATERS, which have long been found ſupereminently uſeful in this ſtage of the diſeaſe.

To thoſe ſalubrious ſprings, as the *dernier reſource*, invalids of this claſs continually repair from various parts of the globe, and particularly from the cyder counties.

Here, after the diſeaſe has baffled a variety of medicines, they often find a complete cure, and return home with joy and gratitude, leaving behind them their crutches as *votive tablets* in teſtimony of the ſuperior efficacy of the water.

Here the liver of ſulphur, in the ſubtilized form of hepatick air, together with a portion of iron in a highly attenuated ſtate, are by nature admirably combined with the aqueous fluid, conſtituting a medicated compound, at once pleaſing to the palate, congenial to the conſtitution, and hitherto inimitable by art.

ARTICLE XXXV.

On the POISON *of* COPPER.

[By the Same.]

Unde fames homini vetitorûm tanta ciborûm?
Audetis veſci, genus ô mortale! quod oro,
Ne facite; & monitis animos advertite noſtris!
OVID. METAM. XV. 138.

Properties of COPPER, *and its extenſive Union with other Bodies.*

COPPER, in conſequence of its ductility and ſplendor, is well adapted to various purpoſes in metallurgy; but it is no leſs remarkable for its ſolubility. It is liable to be acted upon by almoſt all ſaline and metallick ſubſtances, and probably for this reaſon the ancient chemiſts have given it the whimſical name of *Venus*, conſidering it as a common proſtitute to all other bodies. It readily diſſolves not only in every acid, but alſo in alkalies both fixed and volatile, in neutral ſaline liquors, and even in vegetable oils and animal fats, in conſequence of the latent acid which they contain.

Copper when rubbed with a warm hand yields an unpleaſant odour, and, when applied to the tongue, a nauſeous taſte. Expoſed to a moiſt air, it contracts a greeniſh ruſt; even pure water ſuffered to ſtand long in copper veſſels, contracts a coppery taſte, and unwholeſome quality.

It is very remarkable, that water becomes more ſtrongly impregnated with the metal on ſtanding in the cold, than if boiled in the veſſel for a much longer ſpace. The ſame is ſaid to take place in regard to vegetable acids. Hence the confectioners venture to prepare the acid ſyrups even of orange and lemon juice in copper veſſels. Theſe acid preparations, according to *Dr. Lewis*, acquire no ill taſte from the metal while kept in a boiling heat, whereas if kept cold in ſuch veſſels, they ſoon become impregnated with the diſagreeable taſte and pernicious qualities of the copper. But the mere taſte is by no means a ſatisfactory teſt, becauſe a very ſlight impregnation of copper may be ſo far diſguiſed by the acid and ſugar as to elude the taſte, and yet prove injurious to the nervous ſyſtem. Mineral acids are acknowledged to act more powerfully on this metal when aided by heat; and admitting that the action of vegetable acids is on the contrary weakened by heat, yet we have no proof that it is thereby wholly deſtroyed.

Preparations of Copper uſed in Medicine.

This metal with the vitriolick acid yields vitriolate copper, or blue vitriol;—with the vegetable acid, verdigris;—with volatile alkali, tincture of copper;—with ſal ammoniack, ammoniacal copper. Theſe are the principal preparations of copper that are now in uſe for medicinal purpoſes: they act as powerful tonicks, ſedatives, and aſtringents, and become uſeful remedies, or virulent poiſons, according as they are managed. Externally they are employed as eſcharoticks, for deterging foul ulcers, and diſpoſing them to heal. Internally they are ſometimes given in the hyſterick, epileptic, intermittent, and other nervous diſeaſes, but ought never to be adminiſtered without the utmoſt caution. Verdegris, being the moſt intractable of the whole claſs, has long been confined to external uſe, except for the purpoſe of expelling arſenick and other fatal poiſons. It is generally rejected the moment it comes in contact with the ſtomach, and is perhaps one of the moſt inſtantaneous emeticks in nature; but as it operates with great vehemence, it perhaps ought not to be hazarded even in theſe caſes, eſpecially when the inflammation may be ſuppoſed to have already made a conſiderable progreſs.

In various Arts.

This and other preparations of copper are highly eſteemed in the arts, for the beautiful blues and vivid greens which they communicate to various ſubſtances, and are therefore frequently employed in painting in oil and water-colours, in colouring glaſs, and in enamelling. Even the ores of this metal exhibit a variety of exquiſite colours, blue, red, green, yellow, variegated like the rainbow, or peacock's tail. The lapis lazuli, from which the precious blue pigment termed *ultramarine*, is prepared, is no other than an elegant ore of copper. To this the jaſper and the ſapphire alſo owe their beautiful tinge. Ores of this metal are found in moſt parts of the world; but when they happen to be mixed with iron, the copper cannot be ſeparated to advantage by any method yet diſcovered; hence ſome rich copper-mines, on this account, remain unworked.

Copper is ſometimes, though very rarely, preſent in waters under the form of vitriolated copper in ſolution. Such is the celebrated water of Wicklow in Ireland, which yields a conſiderable quantity of copper, by a very ſimple proceſs. Iron bars are immerſed in the water, and after ſome time are found covered with a rich coat of copper.* This inſtance of chemical attraction has impoſed on ſome perſons ſo far as to be conſidered as an actual tranſmutation of iron into copper, but is in fact a mere precipitation.

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* A ſpring of this kind is alſo lately found near Berkeley in Somerſetſhire, which I lately had an opportunity of examining. The water imparts to poliſhed iron a coppery appearance, has a nauſeous ſtyptick taſte, and is powerfully emetick. The family, finding it unfit for uſe, have had recourſe to a neighbouring ſpring, which, however, probably partakes in ſome degree of the ſame quality. Be this as it may, ſeveral of the family have at different times been attacked with ſevere epileptick fits, as they aſſured me on my viſit to one of the brothers then labouring under that diſeaſe.

In Combination with other Metals.

Copper readily unites with other metallick ſubſtances, and affords various compound metals.

Thus copper with about 1-4th part of zinc forms braſs.
——— with 1-10th of tin—bell-metal
——— with 1-8th of arſenick—white copper.

It is moreover the baſis of bronze, ſpecula, Bath-metal, Prince's-metal, and all the yellow compounds prepared in imitation of gold. Even ſilver receives an alloy from copper, before it can acquire a proper degree of hardneſs for plate.

Braſs is leſs diſpoſed to contract ruſt than copper, and bell-metal than braſs; white copper leaſt of all; but the arſenick in its compoſition alone renders it totally unfit for culinary uſe. If acid liquors are ſuffered to ſtand a few hours in any veſſel containing a mixture of copper, they acquire a bad taſte, and conſequently a ſlight impregnation of the metal. Nor are ſilver veſſels wholly exempt from this inconvenience, eſpecially ſuch as are conſiderably alloyed with copper.

Effects of POISON *of* COPPER.

When this poiſon is accidentally received into the body, unleſs it be immediately expelled, it produces the moſt formidable ſymptoms, as enormous vomitings, profuſe diſcharges of bile both upwards and downwards, inflammations and eroſions of the ſtomach and bowels, delirium, convulſions, ſyncope, and death. Nay, even the handling of this poiſon in the form of verdigris, or a compoſition containing it, has in certain irritable habits been known to occaſion very diſagreeable effects.[*] The manufacturers of verdigris, and thoſe who grind it for paint, or uſe it in oil or water-colours, ſeldom fail to experience its noxious influence on the organs of reſpiration or digeſtion.

“I have known,” ſays an eminent Profeſſor of chemiſtry, “vehement vomitings and convulſions in children from the *Unguentum Ægyptiacum*, (whoſe baſis is verdigris) injudiciouſly applied to ulcers in the mouth;[†] likewiſe a perſon, who accidentally having ſwallowed a braſs ſleeve button, was ſeized with violent ſymptoms, and died in miſery, no medicines giving relief."

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[*] See the extraordinary caſe of Mr. Butler of Moſcow, as recorded by Dr. Mounſey. Among other ſymptoms, ſevere itching, and burning pungent pain darting through the limbs like electricity.

Phil. Tranſ. vol. 50, art. 2d. and Sequel, vol. 54, art. 2d.

[†] Newman's Chemical Works, vol. i, p. 98.

Abuſe of Copper Veſſels.

It is extremely unpleaſant to reflect on the dangers to which we are ſo often expoſed by the uſe of copper veſſels for preparing various foods. This conſideration has indeed induced ſome diſcreet families to diſcard this dangerous metal from all culinary proceſſes. But though verdigris is one of the moſt violent poiſons in nature, yet the greater part of mankind, rather than abandon an old cuſtom, are content to ſwallow a portion of this poiſon every day! Accordingly veſſels of copper, braſs, or bell-metal, are ſtill permitted to ſupply their reſpective quota of this deleterious ſubſtance to imbue our ſeveral viands. Having, through long uſage, obtained a quiet ſettlement amongſt us, they now claim, as it were, a preſcriptive right to aſſiſt at all culinary operations—a claim which we ſeem neither to have inclination or reſolution to diſpute: for, notwithſtanding every remonſtrance to the contrary, copper and its compounds continue to diſgrace not only our kitchens, dairies, and confectionaries, but alſo the breweries, diſtilleries, laboratories, and even ſhops of the apothecaries.

caries. The very air of theſe places abounding with acid, oleaginous, and ſaline particles, penetrates and diſpoſes them to diſſolution, even before they are uſed. The mildeſt fluids, ſuch as milk, whey, or even plain water, left to ſtand in open copper veſſels, receive an impregnation of the metal, diſcoverable by the volatile alkali. But it is remarkable that the corroſion always begins at the ſurface, in contact with the air, and is diſtinguiſhable by leaving a greeniſh ring. Such is the power of the air in promoting the action of the menſtruum. On this principle, perhaps, may be explained why acid vapours act more powerfully on lead and copper than the acids themſelves, converting the former more ſpeedily into ceruſs, the latter into verdegris.

People generally imagine that the ill effects of copper are entirely prevented by its being tinned, and therefore without heſitation commit to ſuch veſſels acid ſoups, vinegar, lemon-juice, apple-ſauce, greens, butter, and other articles equally exceptionable, where they are ſometimes ſuffered to remain a conſiderable time without any ſuſpicion of danger. But the tin which lines the copper is ſo extremely thin that it is ſoon abraded, or even penetrated by the verdigris, which inſinuates itſelf through the pores of the metal, and at length betrays itſelf by a green efflореſcence on the ſurface. Add to this, the tin is generally alloyed with a conſiderable proportion of *lead*, beſides an additional quantity contained in the ſolder.

Examples are indeed too frequent of fatal conſequences from foods that had received a taint from copper veſſels, whether from the food being of an acid nature ſo as to corrode or diſſolve a portion of the metal, or from the veſſel having contracted a ſoluble ruſt or verdigris, by expoſure to the air, or being badly tinned. The affecting incident of this kind, which happened ſome years ago to ſeveral gentlemen at an entertainment at Salt-Hill, is ſtill within our remembrance. Though it was then generally attributed to adulterated wine, it was at length brought to light by the confeſſion of the cook, who acknowledged, juſt before her death, that it was wholly owing to the poiſon of copper, in conſequence of her own careleſſneſs, and which, through fear of puniſhment, ſhe had been induced till then to conceal.

On dipping into ſome of our beſt ſyſtems of modern cookery, which have undergone ſeveral editions, I am ſorry to find, amidſt the numerous corrections and improvements, ſo much room ſtill left for amendment, and ſo much ſerious cauſe for animadverſion,

animadverſion. Nor is this to be wondered at. The culinary art depends almoſt entirely on chemical principles, and every profeſſed cook may in ſome meaſure be conſidered as a practical chemiſt; and the kitchen, the laboratory wherein are daily performed various chemical proceſſes highly important to health. The principles of chemiſtry therefore ought to be well underſtood by thoſe who practiſe cookery, and particularly by ſuch as undertake to inſtruct others in the art. But where ſhall we find cooks competent to the taſk? or even a ſingle book on the ſubject that does not betray the author's ignorance, not only of the chemical properties of the various ſubſtances, but alſo of the veſſels and apparatus employed. From this cauſe proceed many dangerous miſtakes and inaccuracies. Theſe from time to time are copied by ſucceeding writers, perhaps equally enlightened as their predeceſſors, and are thus tranſmitted through various new impreſſions. Hence we every where meet with error and inconſiſtency, blended with inſtruction; and theſe pervade all their works.

It is curious to remark, that in the introductory part of theſe complete Treatiſes on Modern Cookery, the reader is generally very gravely admoniſhed againſt the uſe of veſſels made of copper, braſs, and other dangerous materials—that vinegar and ſalt penetrate common earthen-ware, and therefore pickles ought to be kept in ſtone, or glaſs jars. But when arrived at the receipts for pickling and preſerving acid fruits, what muſt be the gentle reader's aſtoniſhment to find thoſe very veſſels expreſsly recommended which ſo lately were abſolutely condemned! Thus, in the proceſs for pickling gerkins, or young cucumbers, " the beſt white-wine *vinegar*, in which they are to be pickled, is ordered to be boiled in a *bell-metal* pot." In a ſubſequent receipt " cucumbers are directed to be pickled in *pewter* diſhes with *ſalt* interpoſed. Afterwards the vinegar to be poured from them into a copper ſaucepan with a little ſalt." It is added " they will then be fit to eat in two or three days!"

Lemon pickles are ordered to be done in an *earthen* diſh—golden pippins in a *pewter* diſh, with *vinegar*, &c.—" To pickle ſamphire; put it into a *braſs* ſaucepan, throw in a handful of *ſalt*, and cover it with good *vinegar*, and ſet it over a ſlow fire."

Others, with leſs reſerve, recommend *copper* coin to be put into each veſſel in which theſe pickles are kept, becauſe, ſay they, " it preſerves their colour, and gives them a beautiful green."

From eating a quantity of fine pickled ſamphire thus imbued with copper, an amiable young lady was preſently ſeized with dreadful convulſions, which ſoon put a period to her life. This melancholy caſe has been already communicated to the publick by my ingenious friend *Dr. Percival.**

If our pickles muſt abſolutely look green to pleaſe the eye at the expence of health, or even life, why ſhould our fair authors, who preſide over all culinary operations, and conſequently over our health and lives, thus mince the matter? Why not ſteep the pickles at once in a ſtrong ſolution of verdigris? This ſurely, on certain occaſions, would be a capital improvement, as it would ſpeedily impart to them a more elegant green, together with the entire virtue of the ſalutary ingredient. By thus rendering them "fit to eat" in two or three hours, inſtead of as many days, it would diſpatch the buſineſs with more certainty and greater expedition.

After pickles we are preſented with creams; therefore, to crown the banquet, I ſhall ſerve up a very curious one by way of deſert.

Ratafia Cream.

Take ſix large laurel-leaves, boil them in a quart of thick cream, adding eggs, ſugar, &c.

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* See Med. Tranſ. of the Royal College, vol. iii.

Whether the ſubtile poiſon of the laurel, which this choice receipt exhibits in a very ample doſe, is rendered wholly inert by boiling, and by being inviſcated with the other ingredients, has not been determined. Or whether it may not ſtill, though in a ſlight degree, exert a portion of its ſpecifick power, ſimilar to that of the celebrated laurel water, muſt be left to future experience. It comes in ſuch a very doubtful form, that I can neither incline to try it myſelf, nor ſafely recommend the experiment to others.

The famous clotted cream of Devonſhire being commonly prepared in *braſs* veſſels, bears alſo a very ſuſpicious caſt. It has ſometimes been obſerved to betray a ſlight metallick taſte, and to excite nauſea and vomiting.

If from the kitchen we ſhould dive into the cellar, we ſhall find that acid vapours are predominant, and that the braſs cocks through which our wine, beer, cyder, and vinegar, are drawn, are generally diſcoloured with verdigris.

In theſe ſubterranean abodes, which are often very damp, the green ruſt is often ſuffered to accumulate till it overſpreads the external ſurface of the metallick cock, and would alſo viſibly pervade the internal orifice of the canal, were it not ſucceſſively diſſolved by the liquor, and waſhed off in the general current, as often as the cock is unturned.* That verdigris is ſoluble, in very conſiderable proportion, in all theſe liquors, and therefore capable of impregnating them with the poiſon of copper, is clearly proved by the following experiments:

		Grains.
1.	Half a pint of rectified Spirit of Wine digeſted on half an ounce of Verdigris, (240 grains) diſſolved —— ——	80
2.	Same quantity of Malt Spirit ——	90
3.	———— French Brandy ——	150
4.	———— Water ——	100
5.	———— common Wine Vinegar	225
6.	———— Diſtilled Vinegar ——	230
7.	———— Wine, Beer, and Cyder, diſſolved more than Water or Spirit, but leſs than either of the Vinegars.	

Should we once more reviſit the ſhops, laboratories, and repoſitories of drugs, we ſhould find that in theſe places, it requires no leſs care and attention to guard againſt the poiſon of copper, than that of lead. Here all the powerful ſolvents of copper are aſſembled; acids, alkalies, neutrals, and oleaginous bodies, ſtand in array, as it were, to attack this metal, and to diſſeminate its poiſon. Their very effluvia render all the copper veſſels and utenſils extremely prone to contract ruſt; hence medicines of the moſt innocent kind unexpectedly acquire a noxious quality. Thus in the diſtillation of ſimple waters, in a ſtill of this metal, the laſt runnings, which are evidently acid, have frequently proved emetick. The ſame effect has been obſerved from diſtilled vinegar, which is indeed leſs to be wondered at; nor is it ſurpriſing that oxymels and acid ſyrups, prepared in copper veſſels, ſhould contract a ſimilar quality. Various other aceſcent medicines being often evaporated in braſs pans, or copper veſſels badly tinned, are expoſed to the like impregnation, and therefore extremely liable to ſuſpicion, ſuch as the lenitive electuary, Caſſia electuary, rob of elder, and moſt of the vegetable extracts.

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* The braſs and copper cocks, now in uſe, being very unſafe, unleſs kept perfectly clean, which is perhaps impracticable, ought to be wholly diſcarded. Might not a mixture of tin and biſmuth, a compoſition incapable of being affected by vegetable acids, be properly ſubſtituted in their place? or perhaps rather the improved wooden cocks, which would entirely prevent danger, or even ſuſpicion?

Even coral, burnt-hartſhorn, crab's-claws, and other inſipid teſtaceous bodies, however improbable it may appear, are not always exempt from this poiſon; for it has lately been diſcovered by the ingenious Mr. Blizard, that when theſe hard ſubſtances are triturated in a bell-metal mortar, if the powder be cloſely examined, it will be found to contain particles of the metal ſeparated by abraſion, viſible to the naked eye, and further diſtinguiſhable by experiments with the volatile alkali.* Bell-metal contains a conſiderable portion of copper, therefore theſe mortars are not only liable to abraſion, but corroſion, by all the ſubſtances that are capable of acting upon copper.

Hence various abſorbent, ſaline, and ſaponaceous bodies, whether reduced into the form of powders or pills in theſe mortars, may eaſily acquire an accidental impregnation of copper.

Braſs mortars and utenſils are equally ſubject to the ſame inconvenience.

Braſs and copper ſcales ſpeedily contract verdigris, from ſalt and groceries being weighed in them, as appears from the green effloreſcence with which we generally ſee them diſcoloured.

Copper Roofs.

Of late the Britiſh copper mines have poured forth the ore in ſuch abundance, that this metal begins to uſurp the place of lead, and to extend its dominion from the cellar and kitchen to the upper ſtories, and even to the roofs of our houſes; ſheet copper being now the faſhionable covering of various new buildings. Notwithſtanding the lightneſs, cheapneſs, and elegance of this new covering, it has certain diſadvantages, which ſeem to have been overlooked.

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* See Experiments and Obſervations on Copper and Bell-metal, 1786.

Being very liable to be corroded by air and watery moiſture when thus expoſed to the weather, the rain-water deſcending from ſuch roofs and gutters cannot be very wholeſome or eligible for internal uſe; yet where ſprings are ſcarce, the inhabitants are obliged to have recourſe to rain-water for all domeſtick purpoſes. Nor will the painted coating, conſiſting of coal pitch, lately propoſed for obviating this inconvenience, be likely to ſucceed, but rather to increaſe the evil, eſpecially as it contains a manifeſt acid: and were white-lead paint to be uſed in its ſtead, the remedy ſtill would be worſe than the diſeaſe.

Copper, moreover, being a powerful conductor of electricity, might not ſuch a wide-extended ſurface of inſulated metal, aided by iron palliſadoes around the parapets, tend to invite the lightning in a ſevere thunder ſtorm, and accumulate it, ſo as to ſhiver the whole building to atoms?

Breweries and Diſtilleries.

The immenſe coppers uſed in theſe and other great publick undertakings, being generally untinned, are peculiarly ſubject to corroſion, and therefore demand uncommon attention to cleanlineſs. In brewhouſes, if any portion of wort (be it ever ſo ſmall) is left to ſtand in the copper when cold, or longer than abſolutely neceſſary, without being well cleaned out, it not only diſpoſes the whole quantity of the ſubſequent liquor ſpeedily to turn ſour, but, what is worſe, impregnates it with the poiſon of copper, incapable of being corrected by the ſucceeding fermentation.

The evil is greatly increaſed by a warm ſeaſon; hence the frequent complaints of ſtale beer, particularly in the ſummer time, among many families. Such [illegible] within two or three weeks becomes acid, and unfit for uſe; and if the impregnation of copper is conſiderable, it proves emetick, and highly pernicious to thoſe who drink it as daily beverage. On the other hand, thoſe brewers who pay cloſe attention to their veſſels, and reward their ſervants for doing the ſame, prevent this unwholeſome impregnation altogether, and have the additional ſatisfaction to find that their beer, inſtead of being returned on their hands as unſound, remains ſweet and entire even in the hotteſt ſummers.

Dairies and Kitchens.

In dairies *milk* and *whey* are heated in large copper or braſs cauldrons untinned; if theſe aceſcent fluids are left to ſtand long, a corroſion of the metal muſt neceſſarily enſue, or if they are ſet by without being carefully cleaned from time to time, they will certainly contract verdigris, being more ſubject to corroſion than lead.

Butter melted in copper ſauce-pans, or thoſe that are badly tinned, is peculiarly liable to acquire the ſame noxious impregnation, as appears from the nauſeous taſte of the metal, and the retchings and ſickneſs which ſometimes ſucceed the uſe of ſuch pernicious ſauce.

Eſculent and aceſcent vegetables, ſuch as ſpinage, cabbage, brocoli, and green peaſe, are generally eſteemed at moſt tables in proportion to the degree of *greenneſs* which they aſſume. To heighten the colour, experienced houſewives, not ignorant of the efficacy of copper, generally give the preference to ſuch veſſels, and to make ſure work of it, on certain occaſions, even direct that copper half-pence alſo ſhould be added! Hence, perhaps, the auſtere metallick taſte and nauſeating quality which we ſometimes, with regret and ſurprize, experience on partaking of theſe dainty inviting vegetables.

Tea.

The water in which tea is infuſed is commonly boiled in a copper kettle, and a remnant is often left to ſtand till the day following, and if the tin lining be worn off,* the water acquires an unpleaſant taſte, which is ſometimes aſcribed to the badneſs of the tea, when in fact, it is wholly owing to the veſſel. After long uſe indeed, the kettle acquires a thick ſtony incruſtation from the earthy particles depoſited by the water, which more effectually guards the copper from corroſion; hence an old tea-kettle (*cæteris paribus*) is much ſafer than a new one. Tea, in its recent ſtate, is ſaid to be dried on hot plates of copper; hence, perhaps, its emetick quality, which however goes off before it arrives in this country. Whether the various nervous ſymptoms, generally attributed to that vegetable, may not ſometimes proceed from a metallick impregnation, ſeems at leaſt equivocal.

The abuſe of copper veſſels is by no means confined to cities, towns, and villages, but extends to camps, fleets, and mercantile ſhips, where fewer accommodations, and leſs attention to cleanlineſs, may be naturally expected. Excluſive of this, copper veſſels at ſea are peculiarly liable to contract verdigris, from the marine acid with which the air is impregnated, to ſay nothing of the additional cauſes derived from the nature of the proviſions, ſuch as fat pork, and other ſalted meats, which are daily boiled in them.——"I have myſelf known (ſays Mr. *Travis*) even a ſmall ſhip's boiler, through neglect of cleaning, become one-eighth of an inch thick of verdigris, which would ſometimes ſeparate in large flakes, and mix with the food; when it was no uncommon thing to have the whole crew ſeized with violent vomiting, &c. But the doſe not being repeated long enough, they in general eſcaped the dreadful effects which attend the uſe of coppers in large men of war, where the friction is ſo great, eſpecially in a rolling ſea) that their coppers, though built as ſtrong as poſſible, are obliged to be new ſet almoſt after every cruiſe."

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* So extremely thin is the tin in general, that even in the better ſort of coating, it has been computed that half an ounce is made to cover 254 ſquare inches, being only one grain of tin to a ſquare inch, and in inferior ſorts conſiderably leſs.

WATSON's Chemiſtry, vol. iv. p. 181.

To this metallick poiſon, chiefly, he endeavours to trace that dreadful ſcourge the *Sea Scurvy*. For, adds he, "the number of ſhips we ſend from Scarborough is about 200 ſail, and the ſeamen about 3000. On board of theſe, *iron* pots are in general uſe, and we have no inſtance of any one having the ſymptoms called *highly ſcorbutick*, except in ſome few of the larger ſhips, in which *coppers* are uſed."[*]

I ſhall not here ſtop to enquire into the validity of this new theory of the ſcurvy, eſpecially as other cauſes which prevail at ſea are deemed fully adequate to the effect, as the ſaltneſs of proviſions, impure air, together with bodily fatigue and watchings, without having recourſe to this poiſon, which in general ſhews its effects more ſuddenly by attacking the bowels and nervous ſyſtem.

However this may be, it is certain there have been innumerable inſtances of the pernicious conſequences of eating foods dreſſed in copper veſſels not ſufficiently cleaned from this poiſonous ruſt. Mr. *Ramſay*, and other navy ſurgeons, have obſerved many extraordinary caſes of madneſs ſuddenly appearing among the crew, for which they could aſſign no other cauſe but the foulneſs of the coppers; but upon their remedying that fault, the diſeaſe preſently ſtopped.[†]

The author of a tract, entitled "Serious Reflections on the Dangers attending the Uſe of Copper Veſſels," publiſhed at London in 1755, aſſerts that

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[*] London Medical Inquiries, vol. ii. p. 13.

[†] Ibid. p. 150.

"the greater frequency of palſies, apoplexies, madneſs, and all the frightful train of nervous diſeaſes which ſuddenly attack us without our being able to account for the cauſe, or which gradually weaken our faculties, are the poiſonous effects of this pernicious metal taken into the body inſenſibly with our victuals, and thereby intermixed with the animal juices."

From the numerous examples of theſe alarming maladies which have appeared ſince the above period, and *particularly of late*, we may conclude that the cauſe (whatever it may be) ſtill ſubſiſts without the ſmalleſt diminution. If to the effects of this poiſon we add thoſe of lead, and trace back their reſpective influence in cookery, pharmacy, and the arts; and reflect how often they may thus gain ſilent admiſſion into our bodies in various foods, as well as medicines, we ſhall advance ſtill nearer to the truth; and perhaps find ſufficient cauſe for the above conjecture. If ſo, we ſhall ſee but too much reaſon to exclaim with the ſons of the Prophets, (2 Kings iv. 40.)

"Death is in the Pot."

But even admitting the myſtery to be thus ſolved, and the real cauſe diſcovered, it ſtill reſts with ourſelves to apply the remedy. Moved by conſiderations of this ſort, the Senate of Sweden, about the year 1753, wiſely prohibited copper veſſels, and expreſsly ordained that none but ſuch as were made of iron or tin ſhould be uſed in their fleets and armies—an example highly worthy the imitation of the Britiſh Senate! The Royal College of London have at length done the ſame, by baniſhing copper veſſels from all chemical and pharmaceutical operations at leaſt, wherein their danger was apparent.*

It therefore only remains to be determined whether we mean to follow ſuch bright examples, or to ſuffer this pernicious metal ſome time longer to diſgrace our kitchens, and mingle its ruſt with our victuals; or in other words, whether we ſhould not rather exert our authority, and reſolve at once to extirpate the cauſe of the evil, than thus tamely ſubmit to receive a daily portion of poiſon from our cooks.

Methods of detecting this Poiſon.

For the benefit of thoſe perſons who know the value of health, and wiſh to avoid the dangers that muſt daily await them while copper veſſels continue to be employed in all culinary proceſſes, I ſhall now add a few additional remarks on the principal chemical teſts mentioned in the firſt eſſay, by way of illuſtration.

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* See the new edition of their Pharmacopœia, in the year 1788.

1*ſt*. The moſt exquiſite teſt of the preſence of copper is the *Volatile Alkali*, or *Spirit of Sal Ammoniac*. If ten or twelve drops of this ſpirit be added to any liquor impregnated with copper, it inſtantly exhibits a blue colour, in proportion to the quantity contained. This elegant experiment has been carried to an almoſt inconceivable degree of minuteneſs by the Honourable Mr. *Boyle*, ſo as to afford at once a ſtriking example of the excellence of the teſt, and the extreme diviſibility of this metal.

2*dly*. Another method is by precipitation with iron. Thus if a piece of poliſhed iron be immerſed ſome time in any fluid wherein copper is held in ſolution by the intervention of an acid, the acid, having a ſtronger attraction to iron, lets go the copper to unite with it, and the copper is afterwards found adhering to its ſurface in its ſhining coppery form, as has been already mentioned.

3*dly*. By *evaporation* of a large quantity of the liquor, and ſubſequent *calcination* and *reduction*, as propoſed concerning lead.*

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* Eſſay ii. p. 381.

Thus may acids, fermented liquors, and various ſuſpected articles of diet, be eaſily put to the teſt.

Where clear pellucid liquors are to be examined, the *volatile alkali* alone is quite ſufficient; but in all turbid or coloured mixtures, it will be ſometimes requiſite to have recourſe to the ſeveral methods ſucceſſively, by which, it is preſumed, the poiſon cannot eaſily eſcape detection.

Indications of Cure.

Practical authors, among whom M. *Tiſſot*, Dr. *Buchan*, and others, who have humanely condeſcended to inſtruct the common people concerning various diſeaſes to which they are incident, ſeem to have been rather deficient concerning the treatment of metallick poiſons. After the uſe of an emetick, they appear to lay the whole ſtreſs on copious dilution with milk, oil, or fat broths, which, though by no means improper, yet are too often found inadeqeate to the cure.

Milk, and oleaginous fluids, it muſt be obſerved, diſſolve metallick ſalts with difficulty, and therefore are much inferior to tepid water, the common menſtruum of all ſaline bodies, and the beſt diluent for waſhing them ſpeedily out of the body. Oleaginous ſubſtances tend to mitigate the ſymptoms, it is true, partly by evacuating, and partly by inveloping the poiſon, but having no ſpecifick power, entirely fail of ſubduing the remainder, which often lurks in ambuſh amidſt the various folds of the interior coat of the ſtomach or bowels, and there continues to exert its miſchievous effects.

As the conſequences of mineral poiſons are ſo ſudden, and the ſymptoms ſo extremely rapid as frequently not to admit of calling in a phyſician, or even any other medical aid, I ſhall here attempt, in ſome ſort, to ſupply the deficiency of thoſe popular and truly reſpectable writers.

Firſt Indication. Whenever this, or any other metallick poiſon has been inadvertently taken, the firſt indication is undoubtedly to expel it as ſpeedily as poſſible by an emetick of very quick yet ſafe operation. For this purpoſe twenty grains of *White Vitriol* may be diſſolved in half a pint of warm water, and drank immediately, followed by very plentiful dilution with ſimple tepid water alone, till the whole of the poiſon is brought up, which may be known by an entire ceſſation of the ſymptoms.

With reſpect to the preſent poiſon, as a ſingle grain of verdigris excites inſtant vomiting, it ſuperſedes the neceſſity of other emeticks, and this propenſity may be increaſed as long as may be convenient, by mere dilution. But where an hour or more has elapſed before the accident is diſcovered, a portion of the poiſon has already entered the bowels, and cannot now be diſcharged by vomiting, but requires peculiar management; which brings me to the ſecond indication.

Second Indication. Which is, to correct the remaining poiſon by proper antidotes, if any ſuch be known, or to diſcharge it downwards as ſpeedily as poſſible. Fortunately this may be generally accompliſhed where the nature of the poiſon is previouſly known, and the remedy adminiſtered before the internal parts are irreparably injured. This applies indeed principally to the poiſons of the metallick claſs, which are much better underſtood than thoſe of the vegetable kind, and of courſe more eaſily decompoſed by chemical agents.

Thus if to a ſolution of verdigris, which is known to conſiſt of copper combined with an acid, we preſent an alkali or abſorbent earth, we know, from the laws of chemical attraction, that the acid prefers either of theſe bodies to copper, and will therefore depoſit the metal in form of an inactive calx, now deſtitute of the virulence it lately poſſeſſed from the acid. Therefore it may be very adviſeable, the moment this poiſon has been taken, to proceed as follows:

In about ſix quarts of tepid water diſſolve half an ounce of any *alkaline* ſalt, as *ſalt of tartar*, *ſalt of wormwood*, or *pearl-aſh*; or if theſe be not at hand, a ſolution of near double the quantity of common *wood-aſhes* when ſtrained through linen, may anſwer the end. Let a pint of this weak *alkaline ley* be drank every half hour, with a tea-ſpoonful of *calcined magneſia*, till the ſymptoms diſappear. As a conſiderable part of the liquor will be rejected by vomiting, this copious dilution muſt be reſolutely purſued till nearly the whole is taken, and the poiſon entirely decompoſed, and waſhed out of the body.

A pint of the *alkaline* ley may alſo be adminiſtered clyſterwiſe, eſpecially if the pain ſhould continue; and the magneſia muſt be repeated till it has operated briſkly, ſo as to cleanſe the ſtomach and bowels very effectually. For while the ſmalleſt particle of the poiſon remains unſubdued, the patient is not ſafe.

The *calcined magneſia* here ſeems greatly preferable to moſt other purgatives, particularly thoſe of the acrid kind, which would be alſo highly improper, on account of their heating quality, and that for the following reaſons:

1*ſt*. Becauſe *magneſia* being perfectly mild and inſipid, it ſits eaſy on the ſtomach, while the others are conſtantly rejected.

2*dly*. It operates in ſo gentle a way as to diminiſh the inflammatory diſpoſition, which the others tend only to exaſperate.

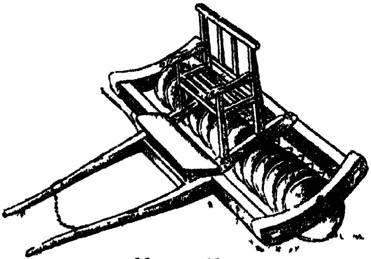
3*dly*. As an abſorbent earth, it corrects the acrimony of metallick poiſons by decompoſing them, and is perhaps the only cathartick that poſſeſſes this property.

After this treatment, ſhould any relicks of the poiſon remain, which however is not very probable, the *liver of ſulphur*, as recommended in the preceding eſſay, or a courſe of *Bath Waters*, accompanied by a milk and mucilaginous diet, will, it is preſumed, ſeldom fail to compleat the cure.

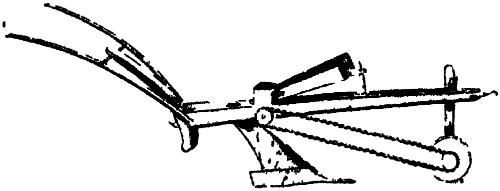
It may not be improper to obſerve that the above method is not confined to *verdigris*, or poiſon of *copper*, but is equally applicable to other mineral poiſons, as thoſe of *lead*, *glaſs of antimony*, *corroſive ſublimate*, *cobalt*, and perhaps *arſenick* itſelf. This

laſt,

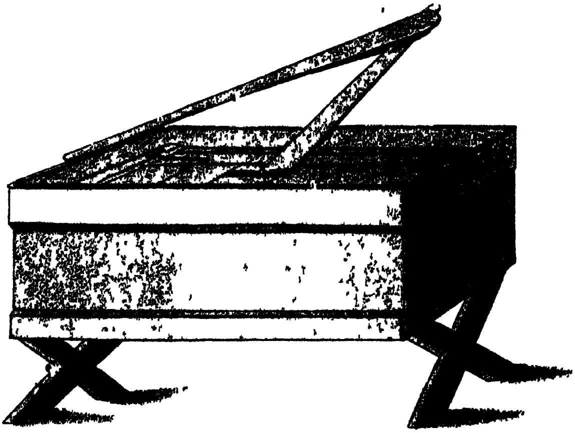
Plate. 2.



Drill Roller.



Murrell's Improv'd Single Drill.



Murrell's Patent Washing Machine.

Hibbart, Bath.

laſt, however, is ſo refractory a ſubſtance, and ſo intractable to almoſt every method of treatment, that its component principles retain a degree of virulence even after they are diſunited, and the metal decompoſed. Hence it is matter of ſerious concern, that this moſt formidable poiſon begins to be adminiſtered as a medicine by almoſt every dabbler in phyſick!

It had long indeed been uſed as an empirical application againſt cancers, but of late it has been alſo given indiſcriminately in ſome other diſeaſes, nay even in common agues, wherein there could certainly be no juſt pretence for having recourſe to ſo doubtful—ſo dangerous—ſo deſperate a remedy!

ARTICLE XXXVI.

On the Mangel-Wurzel, and a new Drill-Roller.

[By Sir THOMAS BEEVOR, bart. to the Secretary.]

SIR,

I Have little to ſay in anſwer to your inquiry reſpecting the Mangel-Wurzel: the few plants of it which I cultivated laſt year afforded me no opportunity or ground whereby I could judge of their effect upon the cattle which fed on them. I could therefore only try whether they would be eaten or rejected by cows, bullocks, and ſheep; and whether, in caſe they were left in the ground, they would ſo well endure the viciſſitudes of froſt and thaw, through the winter, as to furniſh the farmer with a certain and plentiful ſupply of food in the ſpring. With reſpect to the firſt object of my trials, the report I have to make is, that I found all my cows, bullocks, and ſheep, would, after two or three days, feed as readily upon them as on turnips or any other food; but with regard to the latter object, I cannot ſay the reſult was ſo favourable as I could have wiſhed, and did expect; for, notwithſtanding the mildneſs of the weather through the whole of the laſt winter, and the different means I uſed for the preſervation of the roots, by covering ſome of them lightly with earth; others with ſtraw, and leaving others in the ſtate in which they had grown; I did not find half of them ſound or fit for uſe in the month of March. Now if this ſhould have been the caſe with other crops, and they be not found able to reſiſt the power of the froſt, whilſt ſtanding in the field, I apprehend they will never anſwer the farmer's purpoſe as a winter food for cattle upon any large ſcale, ſince there could be very few men found who could ſpare time to pull up the product of from twenty to one, two, or three hundred acres of theſe roots before winter; and when pulled, I conceive there would be ſtill fewer found who could contrive in what manner and place they might be put, ſo as to be ſecure from froſt, and convenient for daily uſe; but perhaps, the evil I mention may not have generally exiſted, and may have been owing to ſome particular unheeded cauſe only; of this I wiſh to be informed, and mean again to attend to in this winter, as I hope other gentlemen will alſo do.

As I know nothing more likely to promote and produce a perfect agriculture than the knowledge and employment of ſuch implements in cultivation as are well contrived, ſimple, and either originally or from their durability cheap, I have ſent you the Model of an Iron Roller, which ſeems to anſwer in all thoſe particulars. It has been lately invented, and is coming faſt into uſe in this neighbourhood; it is contrived for the purpoſe of diſtributing the grain in regular rows, and at a proper depth; and has been found effectually productive of the principal benefits which have been derived from the operation of drill-ploughs, or the practice of dibbling and ſetting the corn by hand, with the great advantage of ſaving both time and expence; as, by the uſe of this ſimple machine, one man may ſow and cover five or ſix acres of corn in one day, uſing

for

for the purpoſe three horſes, as its weight is very conſiderable, and will require ſo many. It has been hitherto chiefly uſed on clover or other graſs lays on the firſt ploughing, but may be as properly employed on land which has been three or four times ploughed. The view of the model will, I believe, give a full and clear idea of its operation, and make it unneceſſary to add further to this account of it. Should the Gentlemen of the Society think otherwiſe, and that the object is worthy their attention, I ſhall readily convey to them every explanation they ſhall require.

I am, Sir, on this and every occaſion, with much regard and eſteem,

Your's, &c.

Hethel, THOMAS BEEVOR.
Dec. 22, 1788.

☞ The model above alluded to is delineated on a ſmall ſcale, as per plate No. 2. The conſtruction of it is ſo obvious, that bare inſpection may ſuffice to ſhew its uſe. It is contrived for three horſes to draw abreaſt, driven by a man elevated behind them. The length of the roller may be more or leſs, according to the choice of the owner: and the ribs of it may be alſo deep or ſhallow, ſo as to determine the depth of the drills, and the diſtances of the rows, by the ſame rule.

The common length is about eight feet; and if eight inch diſtances, for inſtance, ſhould be thought moſt proper, then the roller would have twelve ribs. The common diameter is about twelve inches. It is almoſt unneceſſary to remark, that the ſoil on which this implement can be uſed to greateſt advantage muſt be a light one, the ſurface even, and well pulverized. The ſeed, after the roller has paſſed and prepared the drills, is to be ſown broad-caſt. It falls into the drills, almoſt wholly by the ſowing; but that deſign is completed by a buſh harrow, which is uſed acroſs the drills to finiſh the buſineſs. After this the corn comes up in regular rows, as though drilled by a machine. Two horſes may be deemed ſufficient, on ſome ſoils.

ARTICLE. XXXVII.

On the Turnip-rooted Cabbage, Roota Baga, and Potatoes.

[By the Same, to the Secretary.]

Hetbel, Jan. 22, 1790.

SIR,

THE apprehenſion of increaſing your trouble, by a frivolous and uſeleſs correſpondence, has of late withheld me from writing to you; and though I have now ventured to do it, I am not without a fear, that the ſmall morſels of experi-

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mental information I am able to ſend you, will require your indulgence to accept of with any tolerable degree of complacency.

On the 30th of May 1788, I had four acres of turnip-rooted cabbages ſown in the random or common method of turnip ſowing, which, growing very thriftily, were hoed out the firſt time on the 1ſt of Auguſt following, and again a ſecond time on the 16th. Theſe plants endured the long and ſevere froſt of the ſucceeding winter, without the leaſt injury, though three-fourths of all the common turnips in this county were deſtroyed by it.

On the 21ſt of April 1789, I cauſed (in order to aſcertain the quantity) twenty feet ſquare of them to be taken up from three different parts of the field, which being weighed, I found the average produce to exceed, by ſix pounds, twenty-four tons and a *half* per acre; though at this time their tops had not ſprouted above three inches in height; for theſe plants I was offered by ſome neighbours ten guineas per acre, but as my want of green food was great, I would not accept of it, or indeed of any greater ſum for them.

If farmers would obſerve, they could not but learn, from their repeated experience, the very little dependance which can be had on the ſupply of food for their cattle in the ſpring from a crop of common turnips, either after a ſevere and froſty winter, or after a very mild and warm one, (which laſt conſtantly cauſes ſo early a growth of their tops as to render both them and the roots of little or no worth) and they would then, I conceive, rarely fail to have ſuch a proportion of the turnip-rooted cabbages growing on their lands, as would afford and enſure them a full and excellent proviſion for their cattle for about three or four weeks in the laſt part of the ſpring. A greater quantity of them I do not wiſh to recommend, as the conſumption of them, particularly when drawn, and carried from off the land, is certainly attended with rather more trouble and expence than that of common turnips, eſpecially if the ſoil be wet and heavy;—the beſt for them, and that on which mine grew, was a dry, ſound, mixed ſoil, worth 16s. per acre, at the diſtance of ſeven miles from Norwich.

Though the very accurate, numerous, and valuable experiments of Dr. *Anderſon* on Potatoes, may ſeem to have ſo fully inſtructed the publick in every particular neceſſary and uſeful reſpecting the culture of them, as to render any farther information or communication on that head unneceſſary; yet as freſh and repeated experiments, carefully made, and faithfully related, may chance to throw ſome additional light upon the ſubject, I have ventured to ſend you, in the annexed paper,* the reſult of one which was made here laſt ſummer; however, to avoid prolixity, I have left the corollaries to be drawn from it, to thoſe gentlemen who may condeſcend to compare my account with the firſt three experiments related by the very able and ingenious Doctor, and printed in the laſt volume of the Society's valuable Papers.

I hope you will, before the receipt of this, have obtained from one or more of your numerous correſpondents, ſome account of the uſe, produce, and value, of the *mowing cabbages*, as well as of the *Roota Baga*, of each of which I had laſt ſpring a ſmall parcel of ſeed ſent me, which was ſown, and has produced ſeveral plants. Some of the mowing cabbages were cut down three times, and grew into head again ſo ſpeedily, that had I had leiſure to have attended to them, I doubt not but that the cuttings might have been repeated; but as there is never on my farm any want of freſh vegetable food for cattle in the ſummer, unleſs I can find them continue to vegetate in like manner during the winter (which mine have not done) or very early in the ſpring, I think they will not prove to me, or any one under the like circumſtances, an object of much value.

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* See the Table at the end of this article, p. 427.

The appearance of the Roota Baga plants is much more promiſing; their growth was quick, and their roots very much exceed in ſize all thoſe of the turnip-rooted cabbages growing in the ſame field, and on preciſely the ſame ſoil. They are firm, ſweet, and particularly grateful to all cattle; unfortunately, they have been ſo much ſo to hares, pheaſants, and wood-pigeons, as to have obliged me, in order to preſerve ſome of the few plants I have raiſed, to tranſplant the chief of them into my garden, whereby I might ſecure a ſufficiency of ſeed from them to ſow in the enſuing ſeaſon. Several of thoſe in the field are very much eaten, whilſt neither a turnip-rooted cabbage, a mowing cabbage, a common turnip, or a Scotch cabbage, all ſtanding in the ſame field, are yet touched. They are, when dreſſed for the table, in the manner of other turnips, univerſally preferred to them; and, if they ſhould be found to endure the ſeverity of the winter, retain their goodneſs late in the ſpring, and not decay and rot where bitten by the hares, &c. I ſhall not heſitate to prefer the cultivation of them to that of the turnip-rooted cabbage, or any other vegetable of the kind I have yet met with.

I have lately read a letter from Baron *Dimſdale* to that excellent farmer, and my moſt eſteemed friend, Lord *Adam Gordon*, giving him an account of a turnip called the *Haſtings Turnip*, which he ſays a gentleman near Bath has cultivated in his garden, and of which the account is very flattering. If it be found to be ſufficiently productive to ſerve as a crop for cattle, hardy enough to reſiſt froſt, and enduring late in the ſpring, I ſhall think myſelf greatly obliged if you would procure and ſend me a few ſeeds of it; and when the winter is paſſed, I will communicate to you what opinions I ſhall have formed of the value of the Roota Baga plants for the purpoſes of huſbandry.

I am, Sir, yours, &c.

THOMAS BEEVOR.

⁂ The Society has not yet received any very particular or authenticated accounts of the value of the *Mowing Cabbage*; but for general information, as well as to gratify the curioſity of their valued correſpondent Sir *Thomas Beevor*, they will be glad to receive from any quarter freſh accounts of thoſe who have ſown it.——The Roota-Baga is a plant from which great expectations are formed, both as a vegetable for the table, (in which reſpect Sir Thomas's opinion is generally agreed in) and as an article of food for cattle. Little doubt can be formed of its being hardier than the turnip;—and its greater ſweetneſs and ſolidity muſt give it a preference in the eſteem of many perſons. We hope to be able in our next volume to give a fuller account of it.

April 30th, 1789, I planted Sixty Golden Dunn Potatoes, weighing together 13*lb.* 8*oz. in five rows. The rows two feet aſunder, ſoil ſtrong and rich, but not dunged.*

No.	Square Feet of Land.	No. of Potatoes.	Weight		Diſtance between the Sets	Weight of Product.			Meaſure, ditto				Weight per Acre.				Meaſure per Acre			
			Lb.	*Oz.*		*St.*	*Lb.*	*Oz.*	*B.*	*P.*	*G.*	*Qts.*	*Ton.*	*Cwt.*	*St.*	*Lb.*	*B.*	*P.*	*G.*	*Qts.*
1	60	15 planted whole	3	6	2 feet	9	10	0	1	3	0	2 1/37	44	1	4	8	1356	2	1	1
2	45	15 ditto	3	6	1½ ditto	4	3	0	0	3	0	1 1/5	25	9	7	6	765	1	0	0
3	60	7½ cut into 15 ſets	1	11	2 ditto	3	5	0	0	2	1 1/75		15	4	5	4	363	3	1	0
4	45	7½ ditto	1	11	1½ ditto	2	10	0	0	2	0 2/75		16	8	3	6	487	1	0	0
5	92	15 cut into 46 ſets	3	6	1 ditto	10	1	14	1	3	1	0 1 pt.	29	19	6	2	887	1	2	0
	302	60	13	8		30	1	14	5	1	0	3 1								

A Root of No. 1. produced 86 potatoes, varying from the ſize of a hen's to that of ~~a ſwan~~'s egg. The weight of which was, 1ſt. 5lb.—In the calculation of the weight, very ſmall fractions are omitted.

⁂ Nos. 1, 2, 5, were outſide; 3, 4, inſide rows.——A Buſhel weighs 75lb.

ARTICLE XXXVIII.

On Ploughs, and particularly the Rev. Mr. Cooke's new Swing Plough.

[By JAMES ADAM, eſq; to the Secretary.]

SIR,

I WAS favoured with your circular letter of the 11th of Auguſt, and alſo with your very polite and obliging anſwer to mine, acknowledging at the ſame time the receipt of my book. I am much flattered to find from you, that it has met with the approbation of thoſe Members of your Society who have done me the honour to peruſe it; and as I have therein treated pretty fully of the form and mechaniſm of ploughs, as a matter extremely intereſting to every agriculturiſt, I ſhall beg leave to trouble you with ſome of my lateſt experience and remarks on that ſubject, which I hope may become uſeful in leading towards farther improvement.

In the firſt ſection of my third eſſay, when ſpeaking of ploughs, I have ventured to alledge, that, though the moſt common, they have ever appeared to me the leaſt perfect of all the inſtruments of huſbandry; and that I was of opinion, they were not yet well underſtood, either with reſpect to their conſtruction or mechaniſm. I have likewiſe obſerved in the ſame place, that the vaſt variety of ploughs over all Great-Britain and Ireland, was to me a convincing proof that none of them were perfectly good; for if any one of them had a decided ſuperiority, it would have been pretty univerſally adopted, on ſimilar ſoils.

This was the ſtile of language I uſed frequently to hold with my friend, the Reverend Mr. *Cooke*, the ingenious inventor of an inimitable drill-plough and horſe-hoe. After many converſations of this kind, Mr. *Cooke* was induced to turn this ſubject in his mind, and ſome time after ſhewed me a model, which I have hinted at in the above-mentioned ſection of my book, as promiſing well. Since that time Mr. *Cooke* has purſued his idea, and, in my opinion, with great ſucceſs. In ſhort, he got ſome bodies of ploughs made of caſt-iron, conſiſting of a mould-board regularly twiſted, with the land ſide of the plough, and a plug for fixing on the ſhare, all in one piece. This combination of the parts, which ſo eſſentially affect the operation of the plough, prevents the poſſibility of their undergoing any alteration from the unſkilfulneſs of country ploughwrights, who have only to add the common wood-work to theſe caſt-iron bodies.

Mr. *Cooke* had one of them fitted up at London as a ſwing-plough, with a ſhare of wrought iron, a coulter, and the neceſſary wood-work. This he tried in a loamy ſoil, and it anſwered perfectly well, but this did not ſatisfy me; I therefore requeſted him to come and ſpend a few days with me in the country, and take along with us two of his iron caſts, in order to have them fitted up, and make trial of them in ſome of the ſtrongeſt ſoil in England, and in many places mixed with flints and pebbles. This he cheerfully complied with;—we accordingly put our plan in execution, and for a firſt eſſay, I think I may add, that we met with moſt extraordinary ſucceſs. I was ſo much pleaſed with my two ſwing-ploughs of this new form and conſtruction, that I have ploughed with them ever ſince, and I will venture to ſay it is the beſt ploughing ever performed on ſo ſtrong a ſoil.

I believe, Sir, your Society will admit that this plough has ſome peculiar excellencies, when I tell you that it requires but three horſes inſtead of four, which I have always uſed on this land, which is not only ſtrong but hilly; and I am confident two horſes would be quite ſufficient in this plough, were the land level and loamy: and beſides, that it turns a clean and ſquare furrow of ſeven or eight inches deep; that it lays it over completely, and that it breaks and ſhivers it in the action of turning.

When we find ſo many good qualities in a ſwing-plough, which is at the ſame time ſo ſimple in its conſtruction and tackle, would it not be abſurd ever to employ a wheel-plough, with four horſes, to do the work which can be done by the ſwing with two or three at moſt? and yet ſo powerful is cuſtom, or faſhion, or prejudice, that I ſee every farmer round me dragging a heavy Hertfordſhire wheel-plough over his lands, which in many ſoils does no more than ſcratch them. I am ſure I do not exaggerate, when I ſay that many farmers in this neighbourhood do not turn a furrow of above three inches deep. But beſides this, our clumſy wheel-ploughs are all made with ſtraight mould-boards, which do not turn the flag, unleſs the ploughman lays them over ſo much on the land ſide edge, that the tail of the mould-board ſweeps along the under ſide of the turning turf, and helps to lay it over. This poſition of the plough is attended with one very bad conſequence, which is, that it raiſes the fin of the ſhare out of the level; this makes it cut the bottom of the furrow obliquely, and the turf or flag thus raiſed is not ſquare or parallel, but triangular, leaving the ſoil when ploughed of unequal depths.

This I call a very great defect in our wheel-ploughs, but this is not the only one; for the moſt ſkilful ploughman, in uſing that implement, muſt run it over a certain ſpace before he can lay ſufficient hold of the ſoil to turn up a tolerable furrow, and at the further end of the ridge he repeats the ſame defect, and a certain ſpace is blinked, in gradually raiſing the ſhare out of the ſoil; and thus, both ends of the ridges are worſe ploughed than the reſt of the land, which I call another great defect. But what is worſt of all, is, that in wettiſh or doughy land, the wheels of the plough are ſo clogged with the tough ſoil, that it is impoſſible to make them move round, and thus the ploughing is ſtopped, however preſſing the ſeaſon.

Is it not then aſtoniſhing, that with all theſe capital defects, the wheel-plough ſhould yet remain the favourite implement in this and other counties, where agriculture is ſo well underſtood; and that ſo light and ſo efficient an implement as the ſwing-plough ſhould be ſo much neglected! I will venture to aſſert, that wherever there is a fair compariſon made between the operation of the beſt wheel-plough and the ſwing-plough invented by Mr. *Cooke*, that the latter will be greatly preferred.

I do not however mean to alledge that the ſwing-plough is altogether faultleſs; there is no implement I ever ſaw, without ſome defect, and that of the ſwing-plough is, its being liable to be thrown out of its work by ſome large flint or pebble, or by a ſlip of the ploughman's foot, who, leaning his weight on the handles, raiſes the ſhare out of the ground; but this defect is ſoon remedied by drawing back the plough to where it firſt began to loſe its depth and re-entering the furrow on its former level.

On the [illegible] this defect more than [illegible] the draught, the [illegible] immediate depth of [illegible] clean, ſquare and [illegible] extremity of the ridge? [illegible] deep furrow, I mean one of [illegible] or eight inches in a ſtrong ſoil, which I have never yet ſeen done by any of our wheel-ploughs.

From whence the ridiculous predilection in favour of theſe ploughs ſhould ariſe, I am at a loſs to determine, unleſs it be, as before obſerved, from cuſtom, or faſhion, or prejudice, or ſome ſuch reaſon as frivolous and unſatisfactory. I, who have tried both, and have given to each a moſt impartial obſervation, muſt fairly decide in favour of the ſwing, except in very particular caſes, ſuch as breaking up an old ley or very ſtrong ſoil, rendered hard by a long continuance of drought, or for ſtirring to ſome uncommon depth, ſuch as eighteen inches, which Mr. *Arbuthnot* did with a wheel-plough of his own conſtruction, deſcribed in my firſt volume, page 214, where I have alſo given a plate of it.

Before I conclude, I muſt obſerve, that the fin of the ſhare of Mr. *Cooke*'s ſwing-plough is very nearly as wide as the heel of the plough, by which means the bottom of the furrow is as completely cut by it as the land ſide is by the coulter; thus nothing is left to be done by the breaſt of the plough and mould-board, but to raiſe the flag gradually, and lay it over compleatly.

I think it likewiſe neceſſary to mention, that the Suffolk cat-head and copſe (as deſcribed in the above-quoted eſſay, where a plate is given of them) are what I uſe for regulating the width and depth of my furrow. A ſmall alteration in the length of the ridger over the thill-horſe alſo ſets the plough more or leſs rank; but it muſt be obſerved, that it ſhould never be taken up too ſhort, for that creates a very hurtful angle in the line of traction. Neither muſt I omit to mention, that the riſing flag ſweeps along my caſt-iron mould-board* ſo glibly, touching every part as it paſſes, that it has poliſhed it like bright ſteel.

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* A caſt-iron mould-board is not a correct expreſſion, but we ſay, as incorrectly, a ſilver candleſtick, a glaſs inkhorn, &c. preſerving the names of the materials of which theſe utenſils were originally formed.

Some old farmers in this neighbourhood not over-fond of novelties, and even the ploughwright who works for me, confeſs that they never ſaw ſo much execution done by ſo ſmall and ſo light an implement.

I have been the more diffuſe on this ſubject, becauſe I ſee from the fourth volume of your tranſactions that the improvement of ploughs has been an object with your Society. I am not at all qualified to judge of the ploughs produced to the Society, having neither ſeen them nor the work they performed; but I hope the Society will excuſe my making ſome few remarks upon thoſe trials as they are there related. In the firſt place, I ſhould imagine that the trials of wheel-ploughs and of ſwing-ploughs, in order to be correct, ſhould be made ſeparately, becauſe they are intended for very different purpoſes, and therefore what is a taſk for a wheel-plough, is not a taſk for a ſwing, and *vice verſa.*

In the ſecond place, the taſk preſcribed by your committee was a furrow of four inches deep only, which does not ſeem to me a ſufficient trial of a real effective implement, armed with two coulters, and drawn by ſix oxen. I confeſs, I ſhould have ſuppoſed that no furrow under eight inches was adequate to ſuch a formidable apparatus, let the ſoil be what it would. The execution of the work performed by this plough was ſurely abundantly rapid, and I have no doubt of its being well done, as it was approved of by the committee; but I muſt ſtill contend that the taſk was not ſuitable, or, in other words, this plough was improperly employed upon a four-inch furrow. However, this plough, if tried, would perhaps have performed its part equally well on a much deeper furrow, and therefore it would be highly gratifying to all lovers of agriculture to ſee a plate and deſcription* of it in your next publication; and might I ſo far preſume, I would point out my method of deſcribing Mr. *Arbuthnot*'s wheel-plough (vol. i.) as being not only accurate, but becauſe it enables any perſon to have one made from it, all the dimenſions being marked.

With regard to Mr. *Thomas*'s light ſwing-plough, it ſeems to me extremely ſingular, that when drawn by four ſmall oxen it could not perform a taſk apparently ſo eaſy as a four-inch furrow, without the additional aid of a horſe. This would almoſt lead me to ſuſpect ſome error in the mechaniſm of his plough.

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* A deſcription without a plate would be ſomewhat difficult to render full and plain; this plough is now pretty well known, but perhaps in a future volume a plate of this and ſome other ſorts may be given.

The ſingle wheel under the beam of farmer *Sully*'s plough, I ſhould apprehend would deſtroy its utility as a ſwing, without making it a good wheel-plough. The wheel, I am ſure, muſt render this plough very uſeleſs on wet tough land, as I have before remarked.

I am, with great regard, Sir,

Your moſt obedient humble ſervant,

JAMES ADAM.

Shenley-Lodge, Herts,
Nov. 13, 1789.

[The Society is much obliged to Mr. ADAM for this letter, particularly as it deſcribes a new plough which promiſes to become of publick utility. With regard to Mr. ADAM's ſtrictures on the ploughs uſed at the laſt publick trial for the premiums of this Society, it is preſumed that had he been preſent, and a witneſs of the uncommon ſtrength of the ſoil, under an old ley, and rendered ſtill harder by froſt, he would have thought the taſk no unequal one for ſix oxen drawing a double-coultered plough only on a four-inch furrow. Nor will the difficulty with which a light ſingle plough could be drawn by four oxen, without the aid of a horſe, be conſidered as a trivial argument in favour of the double plough.]

ARTICLE XXXIX.

On various Subjects.

[In a Letter to the SECRETARY.]

L——, South-Wales, Nov. 27, 1789.

SIR,

I AM favoured with your's, and ſhall always be glad to promote the patriotick views of your Society, by communicating my obſervations on Agriculture, but as I have not time to correct what I write, I beg that my name may not be made publick.[*]

I very much approve of ſubſtituting horſe-hoeing crops, eſpecially inſtead of ſummer fallows, which are tedious and expenſive. Our ableſt and beſt farmers have for the laſt fifty years been accuſtomed to lay on their ſummer fallows for wheat from four to five hundred buſhels of lime per acre; which with four or five ploughings and harrowing, and the rent, ſeed, and taxes, coſt them from five to ſeven pounds per acre; and they were ſubject to the like expence the ſecond ſummer before they obtained any benefit from their firſt crops of wheat, which diſtreſſed them, and delayed the payment of their rents, as moſt farmers are ambitious to rent farms too large for their capitals. After wheat they uſually ſowed barley and clover; and then wheat, and barley, and ſometimes oats; which laſt crop did much harm to the land, and they were obliged to let it reſt five or ſix years to their loſs. Having large eſtates under my care, and farmed for ſome years, I am endeavouring to improve them by advice and example, as well as by reſtrictive covenants in their leaſes; and I have the pleaſure to think that my endeavours, with thoſe of ſome other gentlemen in this county, and the rewards offered by our Society (the Glamorganſhire) productive of much good.

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[*] After ſuch a requeſt the Committee cannot feel themſelves at liberty to publiſh the name of this practical and intelligent gentleman; but as the letter is not anonymous in itſelf, and the ſtyle and good ſenſe of the compoſition are ſtriking, no apology to our readers can be neceſſary, for departing from a general rule in ſuppreſſing a ſignature. We wiſh an increaſed number of ſuch correſpondents on any terms, and Agriculture many more ſuch friends.

As the principal object of ſummer fallows is to clean the land, I think turnips, rape, cale, &c. in winter; and potatoes, mangel-wurzel, beans, &c. in ſummer, will fully anſwer that end, and keep the land in good heart, with occaſional dreſſings.

I have ſucceſsfully followed the advice of Sir Thomas Beevor in raiſing turnip-rooted cabbage in drills, and horſe-hoeing the intervals, eating them off with ſheep after my turnips, and immediately ſowing buckwheat (hardly known before here) and afterwards wheat.

In other fields I have planted potatoes, well ploughed the intervals, drawn them with the plough at Michaelmas, and immediately ſown wheat.

Beans anſwer as a fallow crop in the ſame way, and I have no doubt but the mangel-wurzel will anſwer the ſame intention.

After ſending ſmall parcels of the ſeed you ſent me laſt March, to as many of our Members as have farms, I ſowed the reſt very thin in drills two feet aſunder (which ſhould have been three feet;) we had very little rain in April, May, or June, and many died; about Midſummer I thinned them to about a foot aſunder, and made other parallel rows in the ſame field, and when the rain came they grew amazingly, and I ploughed the intervals as I uſually do to potatoes and beans. In Auguſt I drew ſome of the collateral leaves for my cattle and hogs, but the neceſſary attention to the hay and corn harveſt (which this year came very inconveniently together) prevented much attention to this crop, which I have lately drawn and houſed, and I have ſown wheat in the ground.—Many of the plants weighed from fifteen to twenty pounds; and if they keep well in the houſe three or four months, and nouriſh my horſes, cattle, ſheep, and hogs (or any of them) well, I ſhall eſteem them very highly, and think them a very valuable acquiſition in agriculture. I obſerved no material difference between thoſe tranſplanted and not.

My land is not deep, and light enough for carrots and parſnips, which I think are not ſo eaſily cultivated as the mangel-wurzel, and will not produce ſuch heavy crops.

I fatted oxen with raw ſliced potatoes and hay laſt ſpring, and I think it is much better for a farmer to plant them in his fallows, though he ſhould make but ten or twelve ſhillings per ton in feeding his horſes, cattle and hogs, in winter, than to keep his naked fallows often turned and cleaned from weeds, and to let the whole expence fall on the wheat crop, which it will not always repay. Beſides, the potatoes will yield three times as much near great cities and towns; but I draw no general principles from local advantages. In many ſituations it is very expenſive to carry corn to mill or market, but if the farmer can raiſe crops that will pay to feed his live ſtock at home, and increaſe his manure, thoſe creatures will walk a long way to fair or market at a very little expence.

I think it is clearly a good practice to raiſe *culmiferous* and *leguminous* crops *alternately*; in this county lime is ſo cheap, that I occaſionally uſe lime for the former, and dung for the latter crops; by which the land may be kept clean and in good heart many years, without the expence and loſs of time in making ſummer fallows. I find my ſheep more averſe to eat ſliced potatoes than any of the other animals I have named.

Tythe in kind has cramped and will always obſtruct great improvements in agriculture; let ſome fair commutation be ſettled, and a cheaper way of obtaining incloſing bills, and a more permanent poſſeſſion ſecured to the farmer, and I am convinced the improvements in agriculture will in a few years be very great.

I think it would be uſeful if your correſpondents would ſay how often, and upon how large a ſcale, they have practiſed what they recommend, and with what ſucceſs.

It is unreaſonable that the moſt induſtrious farmer, who lays moſt money out of his pocket to buy lime and other manure for his land, ſhall, before he is repaid his expences, tender one-tenth of his crop, which often turns the balance againſt him; whilſt his idle neighbour, having but poor crops at a very little expence, pays the church leſs than half as much for a farm of equal value. I know that the tenth of a good crop is often the whole of, and ſometimes more than the farmer's gain; therefore tythe in kind prevents the cultivation of thouſands of acres, to the great loſs of the community. The arguments againſt tythe in kind are ſo many and ſo ſtrong, as well on account of national and private injury, as the antipathy and law-ſuits created between the clergy and laity, that nothing but infatuation can prevent a reform ſo much wanted, and wiſhed for by all candid well-informed men. I have beneficial tythe leaſes, and therefore am writing againſt my own intereſt. Moſt people that have written on this ſubject want patriotiſm, candour, or ſufficient information. This mode of paying the clergy might be the beſt before the uſe of money, but it certainly is the worſt now.

Reſpecting Mr. *Vagg*'s method of night-rolling, my men could not ſee any ſlugs on the ground or the roller after rolling two or three nights; and when my turnips were four or five inches above the ground, many of the leaves appeared yellow, and on examination, a ſmall long worm was found eating the root, which worm the roller would not deſtroy. I wiſh to know if many farmers have ſucceeded by night-rolling.

I generally drill my turnips, and ſhall in future provide rape, cale, or other plants, to fill up the rows where the turnips miſcarry, ſo that the ground may be full, and my ſheep may not be diſappointed.

ARTICLE XL.

On Timber Trees.

[In a Letter to the SECRETARY.]

THE wiſh you expreſſed that I would ſend the account of the growth of various kinds of timber trees that have fallen under my notice, planted at different periods and under different circumſtances, has induced me to forward the following facts and obſervations; and though I am ſenſible they are not abſtractedly of much value, yet repeated accounts of a ſimilar nature accurately made, and properly compared together, would probably exhibit the ſubject in new lights, and enable your Society to direct the future planter to thoſe exertions that may prove eventually moſt profitable to his eſtate, and moſt beneficial to the publick, which is the ultimate object of your patriotick aſſociation.

No. 1. Red or black poplars planted on meadows near Norwich on a good warm moiſt ſoil, from 1746 to 1748, in ſtands without roots, meaſure at this time (1790) at about five feet from the ground, ſix feet to ſix feet and a half in circumference, and are from forty to fifty feet high.

No. 2. The ſame kind planted in the ſame place and manner, in 1765, 66, and 67, meaſure four feet to five feet and an inch round, and are nearly equally high as the foregoing.

No. 3. A peculiar kind of abele tree planted at Seething in the year 1760, in ſtands without roots ten or eleven feet long, on a bank about thirteen feet broad, with water on each ſide, the bank firm land, meaſure, at about five feet from the ground, five feet to five feet nine inches round, and are tall flouriſhing trees.

No. 4. Aſhes planted out in 1758 and 59, eight to nine feet high, on good meadow ground, are now from three feet eight inches to four feet round.

No. 5. Oaks tranſplanted three or four feet high from a nurſery in 1764 into a good lightiſh ſoil, dug two ſpades deep, well cleaned, the trees planted pretty thick, are become very tall, and meaſure at this time from eighteen inches to two feet round, at about five feet from the ground.

No. 6. Some of the ſame oaks left in the original nurſery, are from eighteen inches to two feet four inches in circumference.

No. 7. Some of the ſame, planted in an upland paſture (the ſoil clay) in 1769, when ten or eleven feet high, are now from eighteen inches to two feet round.

No. 8. A particular timber oak meaſured in
1768—ſeven feet eight inches.
1771—eight feet.
1790—ten feet three inches.

No. 9. I have a ſmall piece of ground little more than half an acre, and worth about eight ſhillings a year planted in 1764 with various kinds of firs, intermixed with young oaks. The firs have been felled by degrees for rails, joiſts, ſpars, and other uſes, to the value of twenty-five pounds, and have left a grove of healthy and promiſing oaks.

On theſe facts I ſhall take the liberty of making a few obſervations. With regard to the firſt and ſecond articles, the poplars, the advantages attending their rapid growth require no comment: but I may juſt remark, the ſoil as already deſcribed was particularly adapted to them, and that theſe plants are very apt to fail, where there are cold ſprings, or the lower ſoil is gravel.

The third, the abele tree, exhibits a remarkable inſtance of rapid growth. An old tenant of mine procured the original tree, I know not from whence, under the name of *Dutch Beech*; finding the cuttings flouriſh uncommonly, I have planted them in a variety of ſoil and ſituation, and at preſent I have not found any in which it does not exceed every kind of tree in its firſt ſtages. I have one particular ſpot where the ſoil is barren ooze, raiſed by an addition of the ſame ſoil thrown out to form a piece of water: I planted it with various kinds of trees; they all died or remained without growth, except ſome ſmall cuttings of this kind, which being intermixed, flouriſhed as uſual, and promiſe to become large trees.

I have planted it on ground where cold ſprings riſe, and where the red or black poplar, after arriving at ſome ſize, died; they flouriſh there alſo with great vigour. A friend of mine has planted them on high and dry ground, where they have alſo exceeded every kind of tree planted with them; the wood has all the apparent properties of this ſpecies, and promiſes to be excellent for turners, and other uſes. Its appearance is by far the moſt beautiful of any of the poplar, abele, or aſpen kind, that has fallen within my obſervation; the bark is of a greeniſh yellow colour, delicately ſmooth, the branches grow in a very pleaſing and compact form; the colour of the leaf in ſpring is a beautiful ſage green, growing darker as the ſummer approaches, the under ſide becomes then of a light colour, the upper of a darkiſh green, forming a medium between the aſpen and populus alba, or abele tree.

I have been thus particular in my deſcription of this tree, not knowing but it may be found in other places, and that ſome of your correſpondents may be induced to propagate it. Its beautiful appearance and rapid growth point it out to thoſe gentlemen who plant for ornament; and as no tree that I have ſeen is ſo cheaply propagated, is leſs delicate as to ſoil, or is ſooner productive, it is conſequently a primary object to the man who plants for profit.

On No. 5, 6, and 7, I have to remark, that the tranſplanted oaks, though for a few years they ſuffered in the removal, recovered themſelves by degrees, and diſcover now, after 20 to 24 years, little difference from thoſe left in their native ſoil: —as to the tree in No. 6 meaſuring 2 feet 4 inches, it was always larger than the others, and therefore no rule for the general average;—even thoſe tranſplanted at 10 or 11 feet high, are ſcarce at all inferior to the reſt.

The growth of the oaks, by the facts recited, appear to bear no compariſon to that of other trees; the firſt remark that conſequently ſtrikes every obſerver is, that this is the leaſt profitable tree that can be planted; and, if a man looks for the produce of the firſt 25 or 30 years only, this is undoubtedly the caſe. Firſt impreſſions are difficult to eradicate, yet I wiſh to ſee as many facts as poſſible collected upon this ſubject, to aſcertain the point indubitably. I think it will appear that the inſtances I have ſtated of the rapid growth of poplars, abeles, and aſhes, are as great as any that have been produced; nevertheleſs, what I have recited, taken altogether, tend to enforce upon my mind the doctrine of the ſuperiority of oak planting, in point of profit;—its beauty and utility will be univerſally allowed me.

The facts adduced prove, that for the firſt 25 or 30 years, poplars, abeles, and aſhes, exceed the oak in growth in the proportion of at leaſt two to one. I wiſh ſome of your ingenious correſpondents could furniſh a regiſter for the ſucceeding 40 to 60 years: but as the durability of human life is too little for ſuch records, and the ſpirit of obſervation is ſeldom tranſmitted from father to ſon through many generations, we muſt be content with reaſoning from detached facts; and this leads me to No. 8.—— I found in my father's papers the two firſt admeaſurements of this tree, and I have within a few days taken that of the preſent date; by this it will appear it has increaſed rapidly and uniformly; and I need not remark that, as it continues to increaſe at the rate of ſomewhat more than $1\frac{1}{3}$ inch yearly, it adds every year a greater and greater quantity of timber, in geometrical progreſſion; and admitting that in 1768 it contained 110 feet of timber, in 1790 it contains 200 feet. I do not know that I am accurate as to the real contents, but the relative proportions are correct, which is all that applies to the preſent argument. The increaſe, which is 90 feet of timber, is wonderful for 22 years, and not to be equalled, as I conceive, by any of the other kinds, at any period of their growth; the difference between the poplars of No. 1 and 2 in 20 years was, in the ſame mode of eſtimating them, only 39 feet of timber each. But if, as in fact No. 9 in addition to this advantage, a crop can be obtained that will amply pay the rent and charges of the land for the firſt 20 or 30 years, and at the ſame time tend to rear and nurſe up the oaks intended for the future grove, we muſt conſider our plantation as only then commencing its career, and charge it with no expences till that period arrives. We ſhall then find, that if the mind balanced upon the ſubject, under the head of the laſt conſideration, the preſent one will preponderate the ſcale in favour of our doctrine: and this reaſoning applies to no other trees we have mentioned, for poplars will not thrive on ſuch ſoils; —the drip of aſhes is allowed to be injurious, and theſe, as well as the abeles, would overtop and ſpoil the firs; not to add, that as all theſe derive their nouriſhment from lateral roots, they would impede if not prevent the growth of firs; whilſt in oaks, experience ſhews that their ſupply is derived from a deeper ſoil, or they are furniſhed with different particles of nutrition; there ſeems too ſomething congenial in their nature, and in their configuration there is an adaption to each other.

When I conſider all the circumſtances, I am inclined to draw this concluſion, that if a regiſter for 100 to 150 years could be procured, of ground applied to the growth of oak timber, and the like quantity applied to the growth of any other kind, the former would prove at leaſt equally productive in quantity, notwithſtanding the ſuperior increaſe of the ſoft woods for the firſt 20 or 30 years, with this additional advantage, that the timber is of one-third greater value.

My object in this memoir is not to decide dogmatically, but to promote a more accurate enquiry on the ſubject. The planters of oak ſeem hitherto to have exerted themſelves, as diſcharging a kind of duty to their country, in propagating this important and indeed neceſſary timber; but as intereſt is a motive more prevalent than patriotiſm, if it ſhall be made appear, as I think it will, that it is to the advantage of gentlemen to plant this kind of tree in preference to all others, upon ſoils ſuitable to it, we may hope to ſee the practice become general, and thus the eſtates of individuals benefited, as well as the national intereſt in this very important article ſecured to poſterity.

[The foregoing ingenious and valuable article is the communication of a Norfolk gentleman, well known and univerſally reſpected; the inſertion of whoſe name would have done honour to this Society: In compliance with his particular wiſhes and diffidence, that name is ſuppreſſed. But it remains with the Secretary, and may be known by any gentleman who may have a motive for enquiry.]

ARTICLE XL.

On the Turnip Cabbage.

[To the Secretary.]

SIR,

I Send you herewith a plant of a ſpecies of vegetable, I believe, as yet but little known in England. I received the ſeed laſt year, under the name of Turnip Cabbage, ſaid to be brought by Mr. *Haſtings* from the Cape of Good Hope. It is a very hardy plant, enduring the winter at leaſt, as well if not better than brocoli. I have found it a moſt valuable acquiſition to the kitchen garden; and it might probably be introduced with advantage by the farmer as an article of fodder for his ſtock. I ſhall take a future opportunity to ſend you a ſmall parcel of ſeed, which I have ſaved from a plant of laſt year's ſowing, and likewiſe ſome particulars reſpecting the mode and ſeaſons of cultivating it.

I am, Sir,

Your humble ſervant,

THO. BROUGHTON.

TWERTON,
Sept. 23, 1788.

ARTICLE XLI.

On the Turnip-Cabbage.

[By the Same.]

SIR,

IN reply to your queries reſpecting the turnip-cabbage, I muſt obſerve, that as the moſt eſſential part of my experiments on that plant, viz. its value in field culture, remains yet to be made; and as I purpoſe (ſhould it ſucceed in that reſpect) to give the publick a ſeparate and minute account of it; I can at preſent ſtate only a few general facts reſpecting it; and this I ſhall do as nearly in the order of your queries as poſſible.

I have not been able to aſcertain in what country it was firſt produced, but am informed that it is very common in Holland, and at the Cape of Good-Hope. It has certainly been known in Britain many years, though not generally. *Miller* does not notice it, but it is particularly mentioned in the liſt of eſculent plants at the end of the octavo edition of "Every Man his own Gardener," by *Mawe* and others, publiſhed in 1776; and it is there eſpecially diſtinguiſhed from the turnip-rooted cabbage, to which it bears little or no reſemblance. It bears a much greater reſemblance to the cabbage tribe than to the turnip, whereas the Roota-Baga you mention (from the ſlight acquaintance I have with it) appears to be more nearly allied to the turnip.

The beſt ſeaſon for ſowing for the garden, appears to me to be the end of May, or beginning of June. Though ſown ever ſo early, I never ſaw one run the ſame ſummer; indeed I have ſown in Auguſt at the cauliflower ſeaſon, and the greater part have ſtood over the following ſummer, and not run till the ſecond ſpring, which is certainly a very uncommon property.

With reſpect to the management of the plants, they require nearly the ſame treatment as brocoli, in regard to tranſplanting, diſtance, &c. They are uſually moſt eſteemed when young, and about the ſize of a moderate garden turnip; thoſe ſown in June will continue good all the winter. The bulb muſt be ſtripped very clean of its thick fibrous rind; after which it may be treated as a turnip. The ſprout or crown is very good, but eſpecially in the ſpring, when they begin to run. I ſhould imagine, from the remarkable ſweetneſs of the bulb, that it is more nutritious than the common turnip. The largeſt bulb I have meaſured was twenty-three inches in circumference.

I took up a plant in February laſt, which was ſown the Auguſt twelvemonth before; which, when deprived of its fibrous root, weighed about twelve pounds; the bulb was conſiderably elongated, and meaſured nineteen inches in circumference, and twelve from the baſe of the bulb to the top of it; it had thrown out forty-ſix lateral ſprouts.

My plants ſtood the winter of 1788, which was a very ſevere one, when all my turnips were deſtroyed. It has been ſuſpected by farmers that the toughneſs of the rind would form an inſurmountable objection to them, as fodder for ſheep; but I have this winter had poſitive proof to the contrary. I have given many of the tougheſt and oldeſt to my ſheep, which not only penetrated through the coat, but even devoured the greateſt part of it.

I do not know where the ſeed is to be procured in any quantity. I propoſe to ſave a great deal this ſpring, if the ſeaſon ſhould be favourable.

I am, Sir,

Your very humble ſervant,

THO. BROUGHTON.

TWERTON,
March 19, 1790.

ARTICLE XLII.

On the Roota-Baga, the great value of Potatoes to the Poor, and on Turnip-rooted Cabbage.

[By Sir THOMAS BEEVOR, Bart. to the Secretary.]

SIR, *May* 3, 1790.

THE plants of the Roota-Baga, which I have preſerved for ſeed, are now in great perfection; the roots are quite ſound, and as good as at Chriſtmas; the heads are by no means ſo large and buſhy as thoſe of the turnip-rooted cabbage; they grow up with one ſingle ſtem with ſmall lateral ſhoots only, ſo that whatever may be the comparative value of the roots, the ſprouts or heads will not produce near the ſame quantity of food as the other. Still they ſeem to me to be moſt ſufficiently inviting to a very extenſive cultivation of them; but as the laſt winter was remarkably mild, their hardineſs to endure and abide ſevere and repeated froſts and thaws, is yet untried. Animals of every kind appear to be immoderately fond of them, leaving all other food for them.

The ſeed I ſhall ſave from them this year will not, I fear, become ripe ſufficiently early to ſow in this next ſeaſon; but Lord *Orford*, who is the moſt communicative, as well as the moſt ingenious and indefatigable experimental agriculturiſt in this county, has promiſed to ſend me two quarts of the ſeed, part of that which is ordered for his own uſe; ſo that if the next winter ſhould prove a ſevere one, there will then have been a ſufficient trial of their merit, to determine whether they can be cultivated with more advantage to the farmer than any of the other winter eſculents.

The few mowing cabbages which I have reſerved for ſeed, abound in the moſt vigorous leaves, which, if after having been eaten down by ſheep or cattle, they would ſprout again as freely and frequently as after they have been mown down, would certainly prove a moſt profitable crop; but this, I believe, is yet to be tried.

The great relief which the poor in this neighbourhood have received, and continue to receive, from the uſe of potatoes, during that price of corn which has made it almoſt beyond their ability to purchaſe, will not readily be forgotten by them; the applications I have received this laſt ſeed or ſetting time for thoſe roots, is wonderful, and have exhauſted a ſtore of about fourſcore ſacks, which I had remaining, after having planted my own quantity.

In conſequence of the very cold weather we have had here, the graſs is but juſt ſpringing, which, as the turnips are wholly eaten up, occaſions much diſtreſs amongſt the farmers, for want of ſome green vegetable food for their ſheep and cattle; whereas, by the aſſiſtance of my turnip-rooted cabbages, (at which I have now two hundred ſheep, and ſeventy neat beaſts, beſides many that are given to horſes and pigs) I have an abundance of the beſt and moſt nutritive food that can be found them; and which will continue in perfection for a week or two longer, or more, if they ſhould be wanted.—From the conveniency and benefit thus derived from them, I cannot but ſtrongly recommend their culture for the ſupport of almoſt all live ſtock for the laſt three weeks in April, or the firſt in May, where the graſs ſhoots late; many years experience has made me confident of the value of them.

I am, Sir,

Your obedient ſervant,

THOMAS BEEVOR.

ARTICLE XLIII.

On the Leith Cart.

[By Dr. J. ANDERSON, to the Secretary.]

SIR,

I USE the freedom to ſend you a drawing of an implement of labour, not as a new invention, for it has been long uſed here, but as one of the lighteſt, cheapeſt, and handieſt implements I ever met with for its purpoſes. It is the cart univerſally employed at Leith, for tranſporting goods of all kinds from the ſhipping to Edinburgh and that neighbourhood. It conſiſts of a pair of ſhafts made of fir joined together by five bars of aſh or elm, with two deals laid upon them, and a ſmall piece of wood below the croſs bars, reſting upon the axle, for ſtrengthening the bars; all which are ſufficiently plain by inſpecting the figure. (See plate I.) The whole of this is ſo light that a man might take it upon his ſhoulder, and ſo ſtrong as to laſt ſeveral years in conſtant employment. The firſt coſt is from twelve to fifteen ſhillings, independent of the axle and wheels.

This ſimple carriage is ſo contrived as to be yoked or unyoked with the greateſt eaſe; for that purpoſe a pair of round rings are fixed by ſhort chains to the collar of the horſe, which ſlip over the end of the ſhafts with the utmoſt facility, and are there fixed by a pin put into a hole. Breeching, becauſe troubleſome for yoking and unyoking, is ſeldom employed.

You will pleaſe to obſerve, that beſides the parts already deſcribed, there is repreſented on the mounted cart (it is kept away from the other to ſhew the conſtruction the better) a croſs bar that riſes higher than the ſhafts; through each end of that bar paſſes an iron pin, which is received into holes [illegible] the ſhafts made on purpoſe; theſe holes are wide enough to let the pins be eaſily drawn out, ſo that the whole bar with the pins, can be lifted off with eaſe and placed nearer or farther from the axle [illegible] the nature of the load may require.

The great beauty of this implement is the [illegible] with which it can be loaded and unloaded; and the men who are uſed to them manage this matter with an adroitneſs and dexterity that has often excited my admiration. Suppoſe, for example, it is a pipe of wine that is to be conveyed away; in that caſe, the horſe is made to go up to where the wine lies, as near as he can conveniently come, and is then unyoked. The cart in that caſe ſtands in the poſition here drawn, and (the pins not being put in the ſhafts after unyoking) preſents an inclined plane, on which the pipe of wine can eaſily be rolled up by two men till it comes above the axle, when, by a ſudden twiſt, it is inſtantly placed lengthways on the cart between the two deals; the croſs bar is placed cloſe behind it, the horſe is put to the cart, and being bound with ropes to keep it ſteady, away they drive.

This is done by two men in a very ſhort ſpace of time; but as there is danger if either of the men ſhould accidentally ſlip his hold when rolling the pipe up, a third hand is uſually called in on this occaſion, who taking the cart ropes, which are always at hand, ſlips a nooſe at each end of the rope over the projecting point at the end of the ſhafts, the rope is then paſſed over each end of the pipe, and brought again to the third man, who tightening it as the others roll up the pipe, effectually prevents the danger of its ſlipping down. It is taken from the cart by a ſimilar operation.

Hogſheads of tobacco and ſugar are put upon the cart exactly in the ſame manner, but as theſe are not ſo long as a pipe of wine, they are allowed to lie acroſs the cart. Two of theſe are uſually put upon a cart at once, the croſs-bar being placed behind the laſt to keep it from ſlipping back; and as the wheels are low, ſo as to raiſe the cart higher before than behind, when in yoke they are well enough ſecured by means of ropes.

When barrels of a ſmaller ſize, or large boxes, are to be loaded, inſtead of taking the horſe away, they make him ſtand ſtill in his place, while the ſhafts are lifted up ſo high before as to allow the hinder points to reach the ground, which gives a ſteeper inclined plane than the former for the ſame purpoſe. This is moſt uſually done for ſliding up large boxes of any ſort; bale goods and ſmall boxes are put upon the cart with the greateſt eaſe by hand, as it is low, and not interrrupted by ſides of any ſort. For grains, bags are made of a convenient length to lie acroſs the cart, and are piled one above another with great eaſe, and bound with ropes. Every carter uſually ſupplies bags for himſelf.

It is aſtoniſhing to ſee the quantity of work that will be performed in a ſhort time by theſe carters with this ſlight implement. The horſes are in general of very little value, few of them being worth more than 5l. yet with one of theſe horſes it is uſual to carry two hogſheads of ſugar or of tobacco from Leith to Edinburgh, which is all up hill, or other loads in proportion. I am perſuaded one of our carters with his horſe and cart would perform twice as much work in a day as a London carter with his three large elephants, and his cumberſome cart, which is of itſelf more than a load for one horſe.

Your moſt humble ſervant,

JAMES ANDERSON.

Cotfield, 10*th Sept.* 1789.

ARTICLE XLIV.

On the Vegetation of Old Grain.

[By SAMUEL SMITH, Eſq; F. S. A.]

GENTLEMEN,

AS the aſcertaining of uſeful facts in agriculture is the profeſſed deſign of your Society, any thing that may tend to ſhew how long ſeed may retain its vegetative quality, cannot be unworthy your attention.

In the year 1754, my brother, a member of the Bath Society, was at Straſburgh, and ſeeing ſome Indian corn growing, he gathered an ear or cone, and preſerved it with the flag on it. It had lain by unregarded till laſt year, when meeting with it, and the date, place, and time of growth being on it, I was induced to try if it would grow. The 28th of

February 1788, I took ſix grains, ſoaked them in water twenty-four hours, put them in earth in pots, and then in a hot-houſe. In about twenty days they began to appear, and four out of ſix grew to about three feet high; two produced the ear compleatly formed, a cone of which I ſend. The pots were taken out of the houſe the latter end of June, and the ears gathered the beginning of Oӕtober. Six other grains were planted in the garden without ſoaking, but did not produce even ſigns of vegetating.

From this experiment is aſcertained a faӕt that ſeed kept dry hath vegetated at the diſtance of thirty-four years from the time of its being gathered. I am, Gentlemen, &c.

Clapham, Dec. 27, 1789. SAMUEL SMITH.

ARTICLE XLV.

On rearing Calves without Milk.

[To the Secretary.]

SIR, *Tytherton, Dec.* 3, 1789.

THE following is as near a calculation of the expences of rearing my calves without milk as I can at preſent aſſert. In the year 1787 I weaned ſeventeen calves, in 1788 twenty-three, and in 1789 fifteen ditto. I bought in 1787 three ſacks of linſeed; I put one quart of the ſeed to ſix quarts of water, which by boiling ten minutes, became a good jelly; this jelly is mixed with a ſmall quantity of the tea of the beſt hay ſteeped in boiling water.

Having my calves drop at different times, I did not make an exact calculation of the expence of this hay tea, but out of my three ſacks of ſeed I had better than two buſhels left at laſt. I gave them the jelly and hay tea three times a day; to the boy who looked after them 6d. per day; the price of the linſeed was 4s. 6d. per buſhel; the whole three years' ſeed 2l. 5s.

My calves are kept in a good growing ſtate, and are much better at this time than my neighbours' that are reared by milk; they do not fall off ſo much when they come to graſs.

I am, your obedient ſervant,

THOMAS CROOK.

[The foregoing is a ſuccinct but uſeful account of a method of rearing Calves, which has often been ſuggeſted, and deemed practicable, but which the Society had never before known ſo fully proved. Mr. CROOK (of whoſe judgment

Cooke's *Patent Drill Machine improv'd & simplified and capable of being converted into a Horse Hoe.*

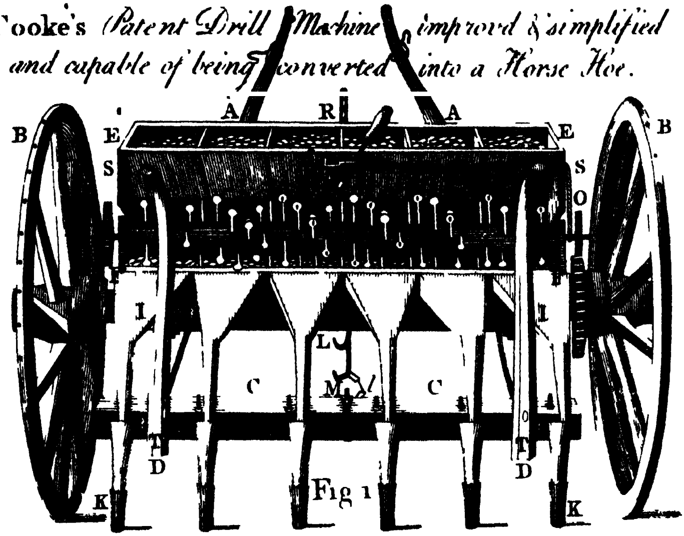


Fig 1

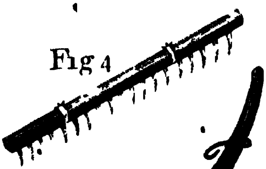


Fig 4

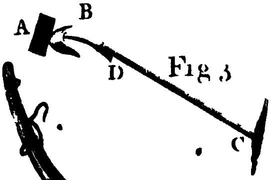
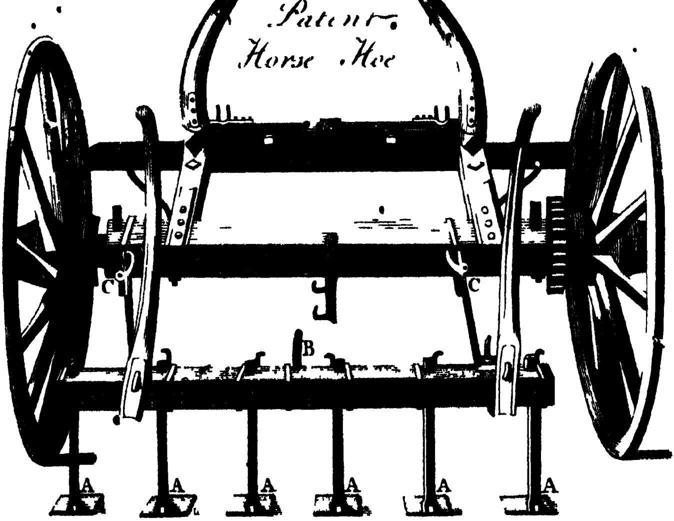


Fig 3

Fig 2



in cattle the publick is well informed) undertook this buſineſs with a zeal which does him credit; and after a ſmall teſtimony of approbation, by preſenting him with a piece of plate, the Society is happy in recommending a practice the value of which Mr. Crook has ſo well aſcertained.]

ARTICLE XLVI.

On the Rev. Mr. Cooke's newly-improved Patent Drill Machine.

THE publick are already well acquainted with the name of Mr. *Cooke*, and his laudable exertions for the promotion of the drill huſbandry. His new Patent Machine, confeſſedly a great improvement on his old one, and vended at the reduced price of twelve guineas, (including the drill hoes, and ſcarificators) may be obvious from a comparative inſpection of the plate annexed, and that given in vol. iii. —But from a motive of reſpect to Mr. *Cooke*, as well as for the further information of ſome of our readers, we ſubjoin the following brief account.

The ſuperior merits of the preſent improved machine, compared with the old one, conſiſt

1*ſt*. In the wheels (B. B. fig. 1.) being ſo large, that the machine can travel on any road without trouble, or danger of breaking; alſo from the farm to the field, &c. without taking to pieces; requiring only half the draught which the old machine requires.

2*dly*. In the coulter beam (C. C. fig. 1, with all the coulters) moving with great eaſe to the right or left, on a principle of the pentagraph, by which means the drills may be made ſtrait; and where lands or ridges are made four feet and a half, or nine feet and a half wide, the horſe may always go in the furrow, without ſetting a foot on the land, either in drilling or horſe-hoeing.

3*dly*. In the ſeed ſupplying itſelf regularly, without any attention, from the upper to the lower boxes, as it is diſtributed.

4*thly*. In lifting the pin M on the coulter beam to a hook L on the axis of the wheels; by which means the coulters are kept out of the ground at the end of the land, without the leaſt labour or fatigue to the perſon who attends the machine.

5*thly*. In going up or down ſteep hills, the ſeed-box is elevated or depreſſed accordingly, ſo as to render the diſtribution of the ſeed regular; and the ſeed being covered by a lid, is ſcreened from wind or rain.

Theſe are ſome of the advantages appertaining to the above improved drill; which, though conſiderable in the proceſs of drilling, are as nothing, compared with thoſe which ariſe from the uſe of the horſe-hoe; of which it may ſuffice to ſay, that from eight to ten acres are commonly hoed in one day, with one man, a boy, and a horſe, at the trifling expence of ſixpence or eightpence an acre, in a ſtile far ſuperior to, and more effectual, than any hand-hoeing whatever; alſo performed at times and ſeaſons when it is impoſſible for the hand-hoe to be uſed at all.

From laſt year's official proofs and extenſive experiments in horſe-hoeing, we are juſtified in ſaying, that by a proper and ſeaſonable uſe of the above drill and horſe-hoe, the largeſt farm in this iſland may be kept as clean from weeds (the bane of all arable lands) as any garden need be, with a clear extra profit of more than the rent of land.

ARTICLE XLVII.

On a new Waſhing-Machine, by Henry Murrell.

MANY have been the implements and machines contrived to expedite the common operation of waſhing, and ſome have even been vended by patent. From trials which have been made of an improved machine introduced to this Society by Mr. *Murrell*, it appears to be very uſeful, and worthy of recommendation; we therefore have given an engraving of it, [plate 2.] and here ſubjoin directions for its uſe.

The night before waſhing, the linen ſhould be ſoaked in cold water mixed with ſome ſoaper's lye. At the time of waſhing, have ready a quantity of boiling water, into which has been ſhred ſoap, in the proportion of two ounces to twelve gallons, ſo well ſtirred as to be all diſſolved, with a mixture alſo of ſoaper's lye.

Then take out the linen and ſoap it, as is uſually done for boiling; after which, put into the machine about twelve gallons of the above-directed boiling water. Linen the leaſt ſoiled is firſt to be put into the machine. Not more than the quantity of ſix or ſeven ſhirts is to be put into each end of the machine at a time, leſt the preſſers being prevented from opening, the linen will be unable to turn, and of conſequence be only partially waſhed. Then faſten down the doors of the machine, and ſet it to work; at the end of ten minutes take out the linen, and ſupply a freſh quantity: the linen taken out is then carefully to be overlooked, and any little remaining ſtains waſhed out by hand. After two or three ſets of linen, according to the foulneſs of it, have been waſhed in the ſame water, let out ſome of the foul water, in proportion to its foulneſs, and ſupply an equal quantity of that above deſcribed from the furnace. Having thus waſhed all your linen through the firſt water, repeat the operation with a freſh ſupply from the furnace, till the whole is finiſhed, then wipe out the machine dry, and leave the doors quite open.

It has been found by experience, that the ſoaking the linen over night in cold water and ſoaper's lye, and ſoaping it alſo before it is put into the boiling water in the machine, will effectually prevent the dirt from being fixed in the linen.

The advantages of the machine are obvious. The ſaving of ſoap, from the more copious uſe of ſoaper's lye, which cannot be uſed in the common way, on account of the waſher's hands; nor for the ſame reaſon can ſo hot water be uſed as in the machine. The ſaving alſo of fuel, at leaſt one third; of labour, two thirds; leſs injury alſo to the linen than in the common way; and, above all, the haſtening one of the moſt troubleſome parts of family œconomy.——A ſtout lad or man may perform the more laborious part of the proceſs.

ARTICLE XLVIII.

REPORT *concerning the Publick Trial of* PLOUGHS *and* DRILLS, *which took place near Devizes, on the 21ſt and 22d of April,* 1790.

IN purſuance of the objects propoſed by this Society by publick trials of Ploughs and Drills, the Committee of Gentlemen-Farmers, to whom a choice of ground for thoſe purpoſes was committed, ſelected a piece for the former in the pariſh of Aſhleton, and for the latter at Roundway. The ſpot for the trial of ploughs was a remarkably ſtrong ſoil, on which wheat had been grown laſt year, but the moſt full of couch-graſs of any land that could be found. This ſpot was choſen the better to bring the double-coultered and the lighter ploughs to a ſevere trial. It was expected that ſix ploughs of different deſcriptions would have ſtarted for the premiums of the Society, but only four were found in the conteſt; one or two having declined, on account of the difficulty of the work, and a new ſwing-plough, lately invented by the Rev. *James Cooke*, being delayed on the road by the carrier.—— The four were as follows:

1. The double-coultered plough, belonging to WILLIAM DYKE, eſq; at *Syren-Cot*; drawn by four horſes two a-breaſt.

2. The Norfolk wheel-plough, belonging to Mr. PRITCHARD, drawn by two horſes without a driver.

3. A light Carliſle ſwing-plough, belonging to Mr. THOMAS, drawn by two horſes a-breaſt, and driven by a lad.

4. A common Wiltſhire plough, belonging to Mr. JACOB GIDDINGS, drawn by two horſes, and driven by a lad.

The reſult of this trial we ſubjoin in the written deciſio of five reſpectable umpires, choſen for the occaſion, viz.

"We, the Umpires choſen for determining the Premiums given by the Bath Society for Ploughing this day, do adjudge the ſaid Premiums as follows:

1ſt Premium, To Mr. DYKE's two-furrow plough with four horſes, as the beſt and cheapeſt plough for general uſe, and do recommend the ſame as a ſaving both of men and horſes; though, from a fault in the conſtruction of the plough produced to-day, the furrow was not laid ſufficiently flat.

2d Premium, To Mr. THOMAS's ſingle-wheel plough with two horſes; and we do recommend the ſaid plough, as having performed exceedingly well on a ſtiff heavy ſoil.

3d Premium, To Mr. PRITCHARD's plough with two horſes without a driver, as being a plough better adapted for ſtiff heavy ſoil than the general ploughs of the country.—And the ploughman of the other competitor, Mr. GIDDINGS, having done his beſt with an aukward bad-conſtructed plough of the county, we think proper to order him a gratuity of five ſhillings.

H. J. CLOSE,
STEPHEN NEATE,
WILLIAM SHORT,
THOMAS DAVIS,
THOMAS LEWIS."

FIFTH VOLUME.